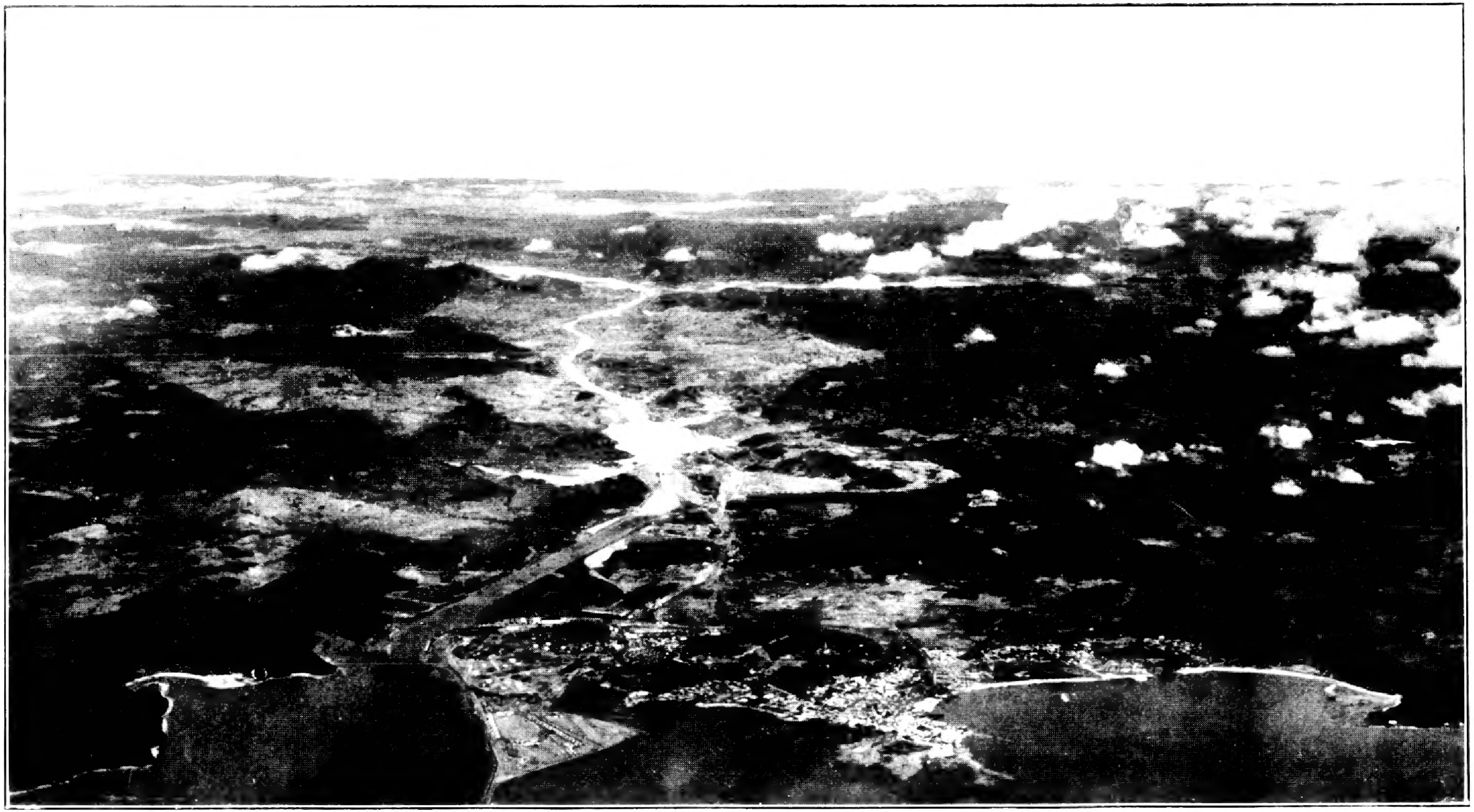

AIRPLANE VIEW OF THE CANAL ZONE AND VICINITY

In the foreground is Panama Bay. Along the coast, to the right of the canal, are Fort Amador, Balboa, Ancón Hill, Ancón, and Panama City, and in the far distance is the Atlantic Ocean. Barro Colorado is the large high island seen in the upper left distance. Official photograph, United States Army Air Corps

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SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM

CONTRIBUTIONS

FROM THE

UNITED STATES NATIONAL HERBARIUM

VOLUME 27

FLORA OF THE PANAMA CANAL ZONE

By PAUL C. STANDLEY

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The United States National Herbarium, which was founded by the Smithsonian Institution, was transferred in the year 1868 to the Department of Agriculture and continued to be maintained by that department until July 1, 1896, when it was returned to the official custody of the Smithsonian Institution. The Department of Agriculture, however, continued to publish the series of botanical reports entitled "Contributions from the United States National Herbarium," which it had begun in the year 1890, until, on July 1, 1902, the National Museum, in pursuance of an act of Congress, assumed responsibility for the publication. The first seven volumes of the series were issued by the Department of Agriculture.

ALEXANDER WETMORE,
Assistant Secretary, Smithsonian Institution.

BULLETIN OF THE UNITED STATES NATIONAL MUSEUM
Issued January 31, 1928

PREFACE

In a letter dated December 6, 1921, to Henry C. Wallace, Secretary of Agriculture, Jay J. Morrow, Governor of The Canal Zone, Panama, solicited the interest and assistance of the Department of Agriculture in the preparation of an illustrated flora of the Canal Zone. In cooperation with the Smithsonian Institution, Mr. Paul C. Standley, associate curator of the United States National Herbarium, was selected to prepare the flora, and funds for Mr. Standley's field work were provided by the Department of Agriculture. The flora itself, which is here presented, will prove, it is hoped, a useful contribution toward the facilities for scientific research in the Canal Zone and toward the development of a knowledge of tropical agriculture.

The work is an annotated list of the flowering plants of the Isthmus of Panama. Although formal detailed descriptions of individual species are not given, keys are provided which will be helpful, as an aid to identification, to those having a technical knowledge of botanical science. In the case of the more important plants, those likely to prove of the greatest interest to the general public, more extensive notes are given which will assist in the recognition of such species. With the aid of the many English and Spanish common names, it should not be difficult for the casual visitor to identify most of the important plants of the Canal Zone.

The flowering plants of the region number about 2,000 species. Among the plants of the Canal Zone are most of the common widespread species of the Central American lowlands. Besides the native plants, the keys include also the cultivated plants, which are represented in the Canal Zone by the majority of the species grown anywhere in Central America. Since there are treated in this work so many of the well-known plants, not only of Central America but also of the West Indies, northern South America, and even of Mexico, the publication will provide a useful source of information regarding the conspicuous plants of those regions also.

The publication is based on the collections of the United States National Herbarium. These include very extensive series of specimens, which have been obtained chiefly by special collectors sent out by the Smithsonian Institution, National Museum, and Department of Agriculture. Many of these specimens were gathered by the Smithsonian Biological Survey of the Canal Zone, organized in 1909, the collections being made by Henry Pittier, William R. Maxon, and A. S. Hitchcock. Mr. Standley has visited the Canal Zone twice in order to study its flora, and has collected most of the species represented there. He has given special attention to the common names current in Panama, and to the local uses of plants.

FREDERICK V. COVILLE,
Curator of the United States National Herbarium

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FLORA OF THE PANAMA CANAL ZONE

By Paul C. Standley

INTRODUCTION

A hundred years before the English colony of Jamestown was founded, the Spaniards, with that zeal which characterized their exploration and conquest of America, had established in southeastern Panama the first European settlement upon the American continent. This colony antedated by several years the conquest of Mexico (1519), which, because of the greater romance and military display that attended it, overshadows the less celebrated settlement on the Isthmus of Panama. The latter, however, was quite as important in the history of the Western Hemisphere, for the narrow neck of land joining North and South America, across which it was easy to reach the Pacific, gave convenient access to the west coast of South America. It became the gateway to the gold and silver mines of Peru and Bolivia, and provided a convenient means of communication with the west coast of Central America and Mexico and with the East Indies.

Panama thus assumed at the very outset of its modern history the most important place in the New World. When the Pilgrims landed on the Massachusetts coast Panama already had a history of over a hundred years, a century filled with events of the most entrancing interest. Life could never have been dull in Panama during the sixteenth century. There were incessant conflicts with Indian savages, attacks by privateers and pirates, and, above all, a constant stream of travelers between Spain and her many American colonies. Across the Isthmus passed the hardy conquistadores who conquered the richest regions of South America and southern Central America. Here were launched the first ships that sailed the eastern Pacific Ocean. Over the road which still may be followed in the forest near Panama City was borne the gold and silver that had been gathered to ransom the last of the Inca rulers. It requires little imagination to repeople the old Cruces Road with Spanish cavaliers, clad in picturesque armor strangely unsuited to stifling tropical jungles; with pompous grandees commissioned by the Madrid court to adjust the perennial disputes and petty bickerings among the colonial officials; with militant friars, who were always in the van of the conquerors' columns; and even with bewildered but resolute gentlewomen, who were never to see again the familiar scenes of their Iberian birthplaces. What richly laden trains of mules and horses floundered through these morasses before the road was improved with the stone pavement by which we now trace it! How many wretched Indians, forced to bear the loads for which no beasts were available, stumbling and sweating over the roots interlaced across the trail, fell here to die in the swamps! Here, too, passed negro slaves, fresh from Africa, brought out to labor in the overseas possessions of the Spanish Empire. If the stones of the old Cruces Trail had voices, they would tell a story such as no other thoroughfare of the whole New World could equal.

Here in Panama the people of Europe first made the acquaintance of the natural products of the American mainland. With many of these the Spaniards were already familiar through their settlements in Santo Domingo and Cuba. How strange must everything have seemed to the early explorers, fresh from Spain! How fortunate were they, if they took more than a passing interest in their surroundings, to find themselves in a world where every plant and animal was new! It is to be surmised that few of these early Spaniards had much interest in the charms of natural history; they were alert only to possible new dangers that might issue from the forbidding forest. Probably their attention was directed to the snakes, mosquitoes, gnats, ants, and other pests, rather than to those objects that hold the interest of a scientific visitor to-day.

But among these early visitors to Panama there were a few learned in the sciences as they were taught in that day. One man, indeed, has left us a record of his observations upon Panama and the West Indies. Oviedo, although primarily a government official who came to Panama to secure the King's share of the gold mined in Darien, must have been a born naturalist. It is hard to imagine him without a notebook in hand, in which he jotted down a memorandum of each strange plant and animal that he saw upon long journeys through the jungles, together with bits of curious information supplied by other travelers, or obtained from natives whom he questioned. Sometimes he was perhaps too credulous; but who can blame him, in a land where the extravagance of the mere truth of new discoveries equaled the wildest fantasies that could be fabricated?

Oviedo was the first of a long line of scientists who have investigated the natural history of Panama, and he it was who published, in 1531, the first account of any of the plants, and also the first book upon the natural history of the New World.

Lionel Wafer, an English freebooter, is another whom we have to thank for one of the earliest and most graphic accounts of the region and its products. Marooned by his companions upon the Isthmus, he spent months wandering in the jungles, and was saved from death only by friendly Indians.

Here on the coast of Panama there was made what is surely one of the earliest American collections of herbarium specimens, and certainly the first ever made in Central America. The plants were gathered about the old Scotch settlement of New Caledonia by a surgeon, James Wallace,[1] about 1700, and the specimens are still preserved in London.

It is, of course, during the past 150 years that most of our knowledge of the plants of Panama has been assembled. Because of its easy accessibility the Isthmus has been visited by many men of science, especially during the last 25 years, and there have been published many papers dealing with its natural history.

Of the seven Central American countries there is available a flora for only one, Salvador, and for that State only an annotated list of species.[2] Only one serious attempt has been made to publish a flora of Panama, that of Berthold Seemann,[3] in 1852–54. Seemann gave as complete an account of the Panama plants as was possible at that time, and a very good list it is, proving the industry of its author, upon whose own collections it was based. Hemsley, in the Biologia Centrali-Americana, listed with the other Central American plants all those known from Panama. Recent intensive exploration in Panama, especially along the canal, has increased so substantially our knowledge of the flora that it is important to make the data accessible to the general public. Certainly there is no part of America which better deserves a published flora than Panama, with its 400 years of history.

The present work is a briefly annotated list of the flowering plants known from the Canal Zone and its environs. Although it would be desirable to have a more comprehensive treatise, with detailed description of species and citation of their synonymy, it seems inadvisable to include such data in the present flora, since the writer has in preparation a descriptive account of the flora of all Central America.

The keys will serve as suggestions for the identification of the plants of the region. The majority of the plants listed are species rather widely dispersed about the Isthmus, therefore it does not seem necessary to indicate their local distribution. It has been the plan to furnish for each genus only general notes, especially such as may be of some interest to an amateur botanist.

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[1] See p. 41.

[2] Standley and Calderón, Lista preliminar de la flora de El Salvador. San Salvador, 1925.

[3] See p. 43.

Inasmuch as the zone flora consists largely of species widely distributed in tropical America, the notes here given may provide useful information regarding common plants of other tropical American countries. Upon the Isthmus grow many of the characteristic species of the *tierra caliente* or lowlands of Central America, of both the Atlantic and Pacific slopes, while in cultivation we find most of the usual economic plants of the Central American countries.

In the keys have been included not only all the native or naturalized species but most of the introduced plants grown for ornament or for economic purposes. Many of these are of quite as much interest to the botanist as are the native plants.

AREA COVERED

The area covered by this flora is so vaguely limited that probably no one except myself will ever know its exact boundaries. In general, it is the area I was able to explore during a visit to Panama in 1923–24. This consists of the arbitrary belt known as the Canal Zone, a strip 5 miles wide on each side of the canal, with certain extensions about Gatún Lake and the Chagres River; and, in addition, of all the adjacent localities which at that time could be reached by available means of transportation.

This slight extension of limits beyond the Canal Zone proper needs no defense. Some of the outlying localities are of higher interest to a botanist than the land within the zone, and they are places to which any botanical visitor is likely to go. Moreover, they make it feasible to include several types of vegetation which are not at all or only imperfectly illustrated within the political boundaries of the zone.

Of these extralimital localities the principal ones are Taboga Island, with its local species otherwise unknown from the region; the savannas northeast of Panama City, supporting a type of vegetation scarcely represented within the zone, together with the forests of the coastal plain which extends eastward past the Tapia and Tecumen rivers, toward Chepo; the forests of the Chagres River, as far as the limestone hills of Alhajuela; and a part of the Province of Colón about the village of Catival.

Nearly all the species of these latter localities may be expected within the zone, but there are some, especially those of the savannas, that will be sought in vain. Plants collected at Porto Bello have not been considered in the present enumeration. Although Porto Bello is not far from Colón, collections made there by Pittier include many species still undiscovered about the canal and indicate that the flora is essentially different.

It would be highly desirable to list all the plants known from the Republic of Panama, and such a report was contemplated when the Smithsonian Biological Survey of the Canal Zone was organized. Panama is still imperfectly known botanically. Little collecting has been done in eastern Panama, and the high mountains of the west, culminating in the rich Chiriquí region, are practically unexplored. Nearly all the species known from Chiriquí are distinct from those of the lowlands of the Isthmus, and to have included those now known from that region would have increased greatly the volume of the present work. Many of the collections from remote parts of Panama remain to be studied, and among them there are many undescribed species whose publication may better await the revisional work necessary for the consideration of the flora of Central America as a whole. It, therefore, seems wiser to defer publication of a flora of all Panama.

If the field work upon which this list is based had been performed a few years later, its geographic limits would have been modified substantially. The Government of Panama is now active in the construction of highways which every year make accessible new regions. At the present time it would be easy to extend the area far beyond that explored by myself in 1923–24.

MATERIAL STUDIED

The present flora is based almost wholly upon material in the United States National Herbarium. Although an attempt has been made to account for species reported in earlier works, most of which are listed by Hemsley in the Biologia Centrali-Americana, only in very rare cases have specimens from other herbaria been consulted.

Naturally the National Herbarium possesses few specimens gathered by early collectors, such as Seemann and Hayes, yet their absence has caused little inconvenience, since there is seldom doubt as to the identity of species described from Panama. The Seemann and Hayes collections are well represented at the Gray Herbarium, but in American herbaria there are probably none, or at least very few, of the still earlier collections, such as those of Beurling.

The National Herbarium has the most extensive series of Panama plants that has been brought together, and most of them are the fruits of recent explorations. Of the older collections, there is a nearly complete set of Fendler's plants from Chagres, many of which have been described as new species. The bulk of the National Herbarium collections consist of a set of the plants collected by R. S. Williams; about 6,000 numbers collected by Pittier, Maxon, and Hitchcock for the Smithsonian Biological Survey of the Canal Zone; several hundred obtained by Killip about the zone and in Chiriquí; a few hundred collected by Brothers Celestine and Gervais about Panama City;

a similar collection made by Macbride; over 1,000 numbers collected by Piper; and over 7,500 numbers procured by myself in 1923, 1924, and 1925.

With such a quantity of material available it is clear that the region of the Canal Zone is better represented than any other locality of Central America. From the very nature of tropical vegetation it can not be assumed that the flora is thoroughly known. Doubtless a few herbaceous species will be added as exploration proceeds, and there is every reason to expect that the list will be increased by many trees and probably a good many species of shrubs. The Pacific slope has been pretty thoroughly collected, but less attention has been devoted to the wet forests of the Atlantic slope, in which, as well as in the coastal swamps, there must exist dozens of localized species.

The trees will reward further investigation better than any other class of plants. Many are so tall that it is difficult to procure specimens, and so infrequently found in flower or fruit that many years will be needed to obtain all the species.

There remain on hand a small number of sterile specimens collected about the zone that it has been impossible to determine. Some of these, when they have been placed definitely, will establish records of great interest to the botany of Central America. Most of the specimens must belong to genera as yet unknown in the North American flora.

PHYSIOGRAPHY

The Canal Zone consists of an irregular strip of land approximately 45 miles long and 10 miles wide, running from northwest to southeast, from the Atlantic to the Pacific, at the narrowest part of the isthmus connecting North and South America. Although the zone was originally defined as a belt extending 5 miles on each side of the canal, this limit has since been substantially modified, in order to facilitate administration of the canal and to suit the convenience of the Republic of Panama. The zone now embraces a much wider area about Gatún Lake, and extends northward far up the Chagres River. Certain tracts near the cities of Panama and Colón have been returned to the Republic of Panama, because they were not needed for administrative purposes; their inclusion within the zone caused great inconvenience to the Republic in preventing direct communication between the capital and the neighboring country except across territory controlled by the United States.

The Canal Zone is a part of the Republic of Panama, leased for a long period of years to the United States Government for the operation of the canal. Most of the towns and settlements of the region lie to the north and east of the canal, toward South America, the southwestern side as a whole being sparsely inhabited and not easily accessible.

More than a quarter of the area of the Canal Zone is occupied by the canal and Gatún Lake. The latter, an artificial body of water formed by damming the Chagres River, is the uppermost and by far the longest level of the canal, its surface nearly 90 feet above sea level. It is fed by the historic Chagres River, which drains the hills lying to the northeast, and enters the lake at Gamboa.

Within the zone all the land is of low elevation, the highest hills attaining a height of approximately 600 feet. Toward both the southwest and the north rise much higher hills and mountains, which form a part of the continental cordillera, their summits in full view from many localities within the zone, but all these mountains are too distant for consideration here. Although the outlying higher hills, which form so imposing a part of the landscape, must have a rich flora, they are so difficult of access that they have not been visited by a botanist.

Paralleling the Atlantic coast are extensive swamps, which extend inland along the Chagres as far as the first locks, at Gatún. The greater part of the Atlantic slope, however, is composed of gently sloping hills which once were heavily forested. On the Pacific slope, which is much narrower, there is now little swampy land within the zone, because most of the swamps formerly existing around Balboa and Panama City were filled during the excavation of the canal.

The Pacific slope of the zone consists chiefly of low rounded hills which increase in height toward the continental divide. A salient feature of the landscape is Ancón Hill, an isolated mass of igneous rock, around whose base lie Balboa, Ancón, and Panama. This peak has been a well-known landmark ever since the first ships sailed the Pacific. Its sharp summit, as seen from the sea, so different from its contour when viewed from the land, must have been a welcome sight to many a weary crew during early colonial days, when the first daring navigators were venturing toward Peru. From the top of Ancón Hill there is a magnificent panorama of all neighboring Panama, with the city of Panama outspread at one's feet, and in the distance the Bay of Panama dotted with rocky islands. Northward along the coast may be discerned the ruined towers of Old Panama. Landward in the far distance the horizon fades into a misty blue mass of hills and mountains, eastward toward Darien, and on the southwest toward Coclé and Veraguas.

Northeast from Ancón Hill spreads a nearly level plain or savanna, skirting the coast. The islands of trees which interrupt its pastures are swampy depressions overgrown with forest and jungle. The coast itself nearly everywhere is rocky, as may well be seen at Panama, where at low tide there is exposed a wide shelf of dark porous rock. In sheltered bays the low tide bares a wide slope of sand, dark like that of the Pacific coast of Central America generally. The savannas stretch far eastward, to Chepo, but they are everywhere narrow, and toward the continental divide they soon merge with the wooded hills.

The chief topographic feature that makes the flora of the Canal Zone interesting is the continental divide, separating the Atlantic and Pacific watersheds, which here sinks to its lowest level, only 260 feet. Seldom in Central America is it possible to see in so compact an area the striking influence exerted upon vegetation by the climatic differences characterizing these two slopes.

Even those who have no direct interest in natural history must notice, as they cross the Isthmus upon the railroad connecting Colón and Panama, the striking change in the superficial aspect of the country that takes place within a very few miles of the divide, near Summit Station. The transition is most evident during the dry season, when the vegetation of the Atlantic watershed is everywhere fresh and green, while that of the Pacific slope is dry and brown. The abrupt decrease in density of the vegetation as the Pacific is approached also is obvious.

These differences in the nature and aspect of the two slopes are well defined everywhere in Central America, and in other regions they are even more sharply marked than in Panama. Such exceptions as are noted, for example, the dry or even desert valleys of Atlantic Guatemala, result from local and unusual physiographic conditions.

The contrast in the character of the vegetation of the two continental slopes is the natural result of differences in rainfall. Nearly everywhere in Central America the year is divided into two well-defined seasons, dry and wet. The dry corresponds in the calendar to the winter of the United States; the wet season to the summer. Strangely enough, throughout Central America the dry season, which on the Pacific slope lasts from about the first of November to the end of March, is called *verano*, summer; while the wet season, which occupies the rest of the year, is called *invierno*, winter. According to Oviedo, this nomenclature was established by the early colonists. It is justified by the fact that the dry season is warmer and therefore more summerlike, while the wet season is cooler, and the rains compel people to keep indoors, as in Europe they must do in the cold winter months.

In the Canal Zone the average annual rainfall on the Pacific slope is approximately 71 inches; on the Atlantic coast it is 130 inches, nearly twice as much. In its effect upon plant life the seasonal distribution of the precipitation is even more important than its quantity.

On the Pacific slope all the rain falls during the summer (of the northern calendar) months, the *invierno*, and throughout the winter months there is rarely any rain at all. On the Atlantic slope, while there is a recognizable division into a wet and dry season, it is never so dry as on the Pacific coast. During the wet season it is very wet indeed, for there are months with an average of an inch of rain per day, and occasional torrential downpours of several inches in a single day; but almost throughout the "dry" season there are frequent showers. There are also heavy dews, and everyone acquainted with the zone is familiar with the dense fogs which often hide Gatún Lake. Leaving Balboa on a bright sunshiny morning the train, soon after crossing the divide, will plunge into a thick fog that fills all the low places and extends high on the hills, to disappear only with the intense sunshine of the later forenoon. Fogs and clouds are characteristic features of the Atlantic slope. After a heavy rainfall it is fascinating to watch clouds form on the hillsides among the dripping trees, and to see them gently pull themselves loose from the forest and float lazily across the valleys.

Around Balboa and Panama toward the end of the dry season in late March the scene is a dreary one with little to suggest our preconceived pictures of the Tropics. Many of the trees have lost their leaves, and even those still clothed have drooping withered foliage which rustles and rattles in the breeze. Many of the bushes are bare, and the herbaceous plants are as brittle as if dried in a kiln, crumpling into dust as one walks over them. Upon the savannas no pasture is left for the cattle. At this season grass and brush fires are of daily occurrence, devouring the parched plants as if they were tinder, and leaving a waste of black in their wake.

This is the hottest season of the year, and the early rains are awaited eagerly to cool the torrid air. With the first showers there comes a marked change in the aspect of the vegetation. Within a few days the savannas are covered with bright green, and the smallest herbs are seen in blossom. Many trees and shrubs begin to flower before the dry season ends, some even in its middle, and when the rains come these quickly unfold their fresh green leaves.

On the Pacific slope one may recognize a vague division into four seasons similar to those of the North Temperate Zone. The dry season, November to March, does resemble in its effect upon vegetation the winter of the North, for many of the trees are just as bare as in the United States, while growth of shrubs and herbs is at a minimum. When the rains come their effect upon vegetation is like that of spring days in the North. The wet growing season that follows corresponds to the summer months of the North. With the decrease in rain, in our autumn months, most plants here mature their fruit and the trees begin to shed their leaves. Of course, even at the driest time of year there are always some plants in bloom in Pacific Panama, and there are many trees that are always green.

On the Atlantic slope there is no such change in the vegetation from one month to another, except under unusual circumstances. In the

Atlantic lowlands of Guatemala at the end of an abnormally dry season the shrubs of the swamps are so parched that their leaves can be crumbled into fragments, but this is exceptional there and is probably unknown in Panama. Everywhere on the Atlantic watershed of the isthmian region the trees and even the herbs are green throughout the year, and many plants are in flower whatever the month. Very few of the trees shed their leaves, although there are some, notably the Bombacaceae, that do so no matter how wet the climate. There is always enough moisture for the most delicate plants, which depend upon this for their survival.

The high precipitation produces a luxuriance of vegetation never equaled on the Pacific slope. The larger and denser trees tend to smother the more humble plants. It thus results that on the dry Pacific slope there is a lesser variety of trees, but a greater abundance of shrubs and a much greater profusion of small herbaceous species.

FLORA OF THE ATLANTIC SLOPE

Over two-thirds of the Canal Zone lies on the Atlantic slope. A large part of this area consists of water, that is, of Gatún Lake and the Chagres River, whose vegetation is scant and relatively unimportant.

Because of varied physiographic conditions and the influence of human occupation the vegetation of the Atlantic slope is highly diversified in appearance and composition. Comparatively little virgin vegetation remains. The construction of the canal, with the necessary excavation of vast quantities of earth and its deposit at distant places, modified both the land and its plant covering. The scars left by this engineering feat are now almost obliterated, as is always true of humid tropical regions where exposed earth is soon hid under a luxuriant growth of plants. Work about the several military posts also has had a considerable effect upon plant life. Extensive low tracts have been cleared and either leveled or filled, to provide drill grounds and aviation fields; while even the remaining swamps have been ditched in order to control mosquitoes. In the forests that survive many trees have been cut to supply lumber and charcoal. There can be little land close to the canal whose vegetation has not been changed in some respect.

The Isthmus of Panama was first visited by Europeans over 400 years ago, and ever since has been continuously under their dominion. Through all these centuries it has been an important trade route. In consequence it is difficult to say what may have been the history of a given piece of ground. Part of the land now covered with what seems to be untouched forest may have been at some time even under cultivation. Deep in the hills, in what appears to be primeval forest where one could easily believe oneself the first visitor, one often trips over a piece of barbed wire or stumbles upon a rusted tin can.

Formerly it was the policy of the Canal Zone government to let the whole zone revert to a natural state, because it was believed the canal would thus be better protected against attack. All the native squatters who held small patches of ground for desultory cultivation were evicted. Later it was proved that the heavy vegetation would protect an invading enemy, and the policy was reversed. During recent years much land on the Atlantic slope has been leased in small or large parcels for agricultural purposes. The labor of the smaller landholders, who control only a few acres of ground, is insignificant in its effect upon the whole vegetation, but it is a different matter in the case of the larger leaseholders, who during the past few years have cleared wide stretches of forest and planted the land with bananas. Banana growing has become an important industry about Gatún Lake, and it has wrought a substantial change in the aspect of the Atlantic slope.

A cattle industry also has been initiated upon government lands, and large areas once forested have been planted with Guinea grass to furnish pasture. These fields are devoid of botanical interest, since, to the exclusion of practically all other plants, they support a thick stand of this coarse grass in dense clumps several feet high, through which one forces a way only to emerge drenched in perspiration and covered with garrapatas or ticks.

There are still limited tracts of forest within the zone, notably on the hills near Frijoles, Gamboa, and Obispo, where it is possible to form a good idea of what the primeval forest of the Isthmus was like. On Barro Colorado Island, nearly six square miles, chiefly of forest, have been set aside for permanent preservation.

These forests upon rolling well-drained land provide perhaps the richest collecting grounds of the zone. A large number of the trees tower to a height of 100 feet or more, with proportionately thick trunks, which frequently are braced with bracketlike buttresses. Other trees, particularly the guarumos (*Cecropia*) and stiltpalms (*Iriartea*), are strengthened by rigid prop roots, similar to those of maize. This rain forest is exceedingly dense and is composed of a great variety of species belonging to diverse families. Homogeneous forests, formed of one or a few species, rarely exist in tropical American lowlands, and nowhere in Central America is such a formation found in a humid coastal area.

The trees of these wet Panama forests are so tall that it is difficult to determine their identity, except in the case of a few with distinctive foliage. The native woodsmen recognize a tree by its bark, or by a slash in the trunk which exposes the wood and sap, parts of little significance to most botanists. The latter must resort to the fallen leaves and the flowers and fruits that strew the ground.

Of the large trees, one of those most easily recognized is the star-apple (*Chrysophyllum*), a giant tree whose handsome dark leaves, brown-silky beneath, are easily spotted, even at a distance, as they rustle in the breeze. The tonka or almendro (*Coumarouna panamensis*) and cabbagebark (*Andira inermis*) are abundant, mingling with dozens of others, such as the wild figs (*Ficus*), huge trees but useless, except as they supply food to flocks of toucans, parrots, and other noisy birds; the caraños (*Protium*), which yield fragrant resins; the spiny-trunked Zanthoxylums; *Inophloeum armatum*, from whose inner bark the wild Indians of Panama make their clothing; rubber-trees (*Castilla panamensis*); and the *Virolas*, relatives of the nutmeg. Because of the difficulty of procuring satisfactory specimens, it requires a long time to know the tropical forest trees; therefore it is certain that in the zone there are many species still undetected. Unfortunately, also, many forest trees flower for but a brief season, and their fruits persist only a short time, thus increasing the difficulty of their study.

In the wet forest there are distinct tiers of vegetation. Beneath the tallest trees lower ones of other kinds find space for expansion. Among them are the mangabey (*Didymopanax morototoni*), conspicuous because of its broad digitate leaves, which are pale underneath; the membrillo (*Gustavia superba*), with long narrow clustered leaves, large waxy white blossoms, and edible fruit; a few tree ferns with plumelike foliage; and, preeminently, the palms, most of which find in the deep shade their favorite habitat. A few of the palms thrust their crowns above the forest roof, but most of them are of humbler stature.

The diversity and relative abundance of palms and tree ferns is an excellent criterion for estimating the true nature of the forest—whether it has ever been cut or not. These, for the most part, are plants that can not endure strong sunlight, and when the original forest is once cut over they do not soon reestablish themselves in the second growth that springs up immediately and outwardly simulates a true virgin forest.

Beneath the trees are thickets of shrubs, representing a wide range of families. Rubiaceae are unusually plentiful in Panama, especially species of *Psychotria*. Other conspicuous shrubs are quassia, with showy red flowers, the Pentagonias, wild cacao (*Theobroma purpureum*), many handsome melastomes, Myrsinaceae, *Strychnos* vines, and Cestrums. The shrubs in the hilly forest frequently form only a sparse growth, but again they may be interlaced so intricately as to be almost impenetrable. In some localities one may traverse the forest almost at will without disturbing the bushes, but in others close by it is necessary to cut a trail with a machete almost every foot of the way, especially when the shrubbery is overgrown with such vines as *Smilax*.

The herbaceous vegetation of the forest is relatively unimportant. Although generally of a weedy nature and composed of cosmopolitan species of slight systematic interest, there are in Panama occasional endemic species, especially in such groups as the Acanthaceae and Gesneriaceae. The herbs vary greatly in size, from the diminutive *Leiphaimos* (Gentianaceae), a white-stemmed saprophyte with small bluish flowers, to the rank Heliconias, Calatheas, and *Costus* species.

Lianas, or coarse woody vines, form a picturesque element of the forest, and often a serious impediment to the explorer. Most of them have comparatively slender and flexible woody stems, quite naked below but climbing to the tops of the higher trees, where they expand their foliage and inflorescences. The stems seldom adhere closely to the tree trunks but more commonly dangle loosely from the branches. The majority of the lianas are Bignoniaceae, which are highly diversified in Panama, their catalpalike blossoms providing fine displays of bright color for a short season.

Epiphytes likewise contribute an important element to the forest vegetation. There is scarcely a single large tree which does not bear a heavy load of epiphytic plants clinging to its trunk and branches. In the lowlands the epiphytes perch so high on the trees that it is hard to collect them, consequently there must be a good many still unknown to science. One tree will yield one or several dozen kinds. Some of these are small, but others so large and heavy that they tax severely the burdened tree. The epiphytic plants are chiefly ferns and monocotyledons—aroids, bromeliads, and orchids—but there are many mosses, hepatics, and lichens, and a few representatives of higher families. Most conspicuous and abundant of all are the aroids, which are represented by a multitude of species. A few aroids are stemless and comparatively small, but the majority are coarse vines, adhering tightly to the tree by firm masses of interlaced roots, and they often have stems several yards long, with huge leaves and inflorescences. The largest of all is *Anthurium holtonianum*, with leaves 4 to 6 feet across, and the Monsteras, which are distinguished from all other American plants by their fantastically perforated leaves. Some aroids have slender but very tough cordlike roots many yards long, loosely pendent from the high branches nearly or quite to the ground.

Certain bromeliads also attain an immense size. There are monstrous specimens of them in Mount Hope Cemetery, some of them so heavy as to break the limbs of the shade trees on which they grow. The bromeliads are important because their leaves usually have enlarged or inflated bases in which water collects, thus affording breeding places for mosquitoes. Other animals also find shelter among the leaves, a study of the Costa Rican bromeliads having shown that they harbor representatives of an unexpectedly wide variety of families.

One of the most characteristic features of these wet lowland forests is the absence of color other than green. Usually not a single showy flower is visible in any direction. It is true that there are always flowers close at hand, but they are small, greenish or white, and inconspicuous. Some herbaceous Acanthaceae as well as plants of other groups have showy blossoms, but rarely are they abundant. If the trees have brilliant flowers they are borne on the upper part of the crown, so that only when a forested hillside is viewed from a distance are the flower-decked trees conspicuous. The same is true of the gaudy Bignoniaceous vines draping some of the tall trees. When one does discover a fine display of color in these monotonous forests it is all the more appreciated. Such a treat is sometimes afforded by the vividly colored bracts of *Warscewiczia*, *Pogonopus*, and *Cephaelis tomentosa*, the red racemes of quassia bushes, the orange and red of *Aphelandra sinclairiana*, and the starlike crimson blossoms of *Passiflora vitifolia*.

Similar to the well-drained forests are the wooded swamps so well displayed near the Atlantic. The best places for investigating this type of vegetation are the extensive deep, densely forested areas about Fort Randolph and Fort Sherman. Such swamps as still survive have been little altered by man. Some formerly in existence were filled to provide sites for Colón and Cristóbal, and for the Army and Navy posts, and others have been ditched in order to control the mosquitoes, but, on the whole, they will long remain in approximately their primitive state.

The swamp vegetation is often extremely dense, and beneath the trees it is sometimes so dark at noonday that one almost feels a need for artificial light. Here also the trees are well grown, but not so tall, probably, as on the higher ground, nor is their variety so great. Cativo trees (*Prioria copaifera*) are plentiful, carpeting the ground with their broad thin pods, which are said to be a favorite food of peccaries. Manicaria palms occur in thick stands, but other palms are few. Of shrubs there is a profuse variety, including many Rubiaceae. It is only in such situations that we find *Brownea macrophylla*, perhaps the most gorgeous plant of the Canal Zone, a half-scandent shrub, growing in the darkest slimiest swamps, bearing upon its naked stems near their bases great rosettelike heads of flowers that suggest some parasitic growth, and of such an intense shade of red that they seem to glow, as if afire.

Many of the coarse monocotyledons are abundant in such swamps, the Heliconias, Marantaceae, and Zingiberaceae. Some Heliconias are almost as large as plantain and banana plants, their massive columnar stems so densely and solidly set as to bar passage except by use of a machete. Heliconia thickets, incidentally, are not worth the labor required to penetrate them, for they harbor no plants of interest.

Where the shores of the Atlantic are protected from the waves they are bordered with mangrove thickets, in no way different from such thickets as they occur throughout the American tropics. Everywhere mangrove thickets are repulsive in appearance if viewed from within, with their twisted interlaced trunks suggestive of serpents writhing in the ooze and slime; seen from off shore mangroves are admittedly a beautiful sight, and it is best to know them so. With the true mangrove (*Rhizophora*) are associated the black-mangrove (*Avicennia nitida*), the white-mangrove (*Laguncularia*), and button-mangrove (*Conocarpus*), and a few other shrubs and trees of lesser abundance, such as *Pavonia scabra*, *Cassipourea elliptica*, and *Rhabdadenia paludosa*. The mangrove swamps extend inland along the Chagres as far as Gatún, that is, as far as the tide penetrates.

Wherever along the Atlantic coast of Panama there are sandy beaches exposed to the surf, here will be found a well-developed strand vegetation. Over the bare sand trail the ropelike stems of goatfoot morning-glory (*Ipomoea pes-caprae*) and *Canavalia maritima*, while near by is a bulbous plant which seems strangely out of place in such a situation, the spiderlily (*Hymenocallis americana*). Other beach plants are *Kyllinga peruviana* and *K. pungens*, *Philoxerus vermicularis*, *Vigna repens*, and *Croton punctatus*. There are usually low, rounded, and very compact, wind-blown clumps of seagrape (*Coccoloba uvifera*), with stiff handsome foliage, nickernut (*Caesalpinia crista*), and other shrubs such as *Dalbergia ecastophyllum*, *Omphalea diandra*, and *Xylosma panamensis*.

Another distinct type of vegetation is that occupying land recently under cultivation but now abandoned. In the *tierra caliente* of tropical America the usual method of agriculture is to clear a tract of land, plant it for a few years until the soil is exhausted, then abandon it and clear a new field for cultivation. This practice is followed about the Canal Zone. Fallow fields soon are overgrown with coarse weedy shrubs and herbs having slight interest for the botanist. In such places guarumo trees (*Cecropia*) form a dominant feature of the landscape. In aspect guarumos are unique even in the tropics, and quite unlike anything known in the North. Their tall, smooth, pale green or whitish, sparsely branched trunks, and their broad, umbrellalike, deeply lobed leaves, covered beneath with white felt, give them an appearance quite their own. The Heliconias and Calatheas are prompt in invading clearings, along with many lush grasses, and such shrubs and trees as *Adenaria*, lantanas, indigo (*Indigofera suffruticosa*), Serjanias, Triumfettas, *Piper auritum*, *Trema micrantha*, *Helicteres guazumaefolia*, guacimo (*Guazuma ulmifolia*), *Conostegia xalapensis*, and balsa (*Ochroma limonensis*).

Between Colón and the picturesque little settlement of Catival, with its steep-roofed grass-thatched huts, there are low hills which seem to have a distinct type of vegetation. I suspect that these hills may have been cleared at some time, and that the shrubbery and trees are second growth, but the species represented are not the common weedy ones found ordinarily in such places. The thickets suggest rather those occurring northeast of Panama, and the species represented are for the most part identical. Small *Vismia* trees form almost pure stands, and an endemic species of *Solanum* (*S. hayesii*) is one of the characteristic small trees.

Aquatic and subaquatic vegetation finds a favorable medium for development on the margins of Gatún Lake and its tributaries. It is to be regretted that no study was made of the former condition of the Chagres Valley, and of the establishment along the edge of the artificial Gatún Lake of a new shore formation. When the lake was filled the swampy ground along the river was inundated, but in gentle inclines along the shores there now are swamps which appear to have existed forever, although they are of very recent formation, and formerly they must have been well-drained hillsides.

The valley of the lower Chagres River was overgrown formerly with dense forest composed of exceptionally large trees. This forest was probably unlike anything now remaining about the zone, and with its destruction there was lost what was possibly the most interesting flora of the whole region. About the borders of the present lake there is no similar swampy forest in process of formation, because there is no land suitable for its development. Before the water was turned into Gatún Lake, the large trees along the main channel were felled. The others were left standing, and they remained alive for some time after flooding. Now they are only dead gray stumps, which in some places are so abundant as to give a very dismal air to the landscape.

For a long time these half-submerged trees furnished a unique collecting ground for orchids, which for accessibility has perhaps never been equaled elsewhere. Some of the orchids collected at this time will never be found again, at least in the immediate vicinity, and it is likely that some species never described are now extinct. At present only a few epiphytes persist upon the weathered stumps. They are chiefly aroids and bromeliads, with a few common orchids that have been rejected by commercial collectors.

Along the shores of Gatún Lake rank grasses constitute the preponderant part of the vegetation, together with sedges, among them sawgrass (*Mariscus*) and a giant *Cyperus* (*C. giganteus*), much like the papyrus of the Nile, and coarse herbaceous plants such as arrowhead (*Sagittaria*), *Pluchea*, pickerelweed (*Pontederia cordata*), Jussiaeas, smartweed (*Polygonum punctatum*), *Hibiscus sororius*, and the spiny blue-flowered *Nama spinosa*. In shallow water stand frequent shrubs and small trees, and the shore is often bordered by a showy melastome, *Miconia argentea*, with handsome green and white leaves. The level of Gatún Lake fluctuates in response to the seasonal rainfall, and this fluctuation must have some effect upon the vegetation of its banks.

Truly aquatic vegetation is abundant in the lake as well as in isolated swamps and lagoons. White waterlilies (*Castalia*) float upon the quiet water in association with many other plants. The most conspicuous is probably the water-hyacinth, which once threatened to interfere with navigation because of the rapidity with which it propagates. Systematic effort is now directed to the control of this and other water plants, with the result that in the canal they are not plentiful. At Gamboa large masses of them are taken from the Chagres as it enters the lake. Among the aquatic plants common in these waters are bladderworts (*Utricularia*), *Jussiaea natans*, *Echinodorus*, a floating fern (*Ceratopteris*), *Salvinia*, water-lettuce (*Pistia*), duckweed (*Lemna cyclostasa*), and *Nymphoides*.

FLORA OF THE PACIFIC SLOPE

A blindfolded person acquainted with Central America if set down at Balboa or Panama City would recognize immediately his eyes were free that he was on the Pacific coast. Both the plants and the scenery would be familiar. The vegetation of this comparatively arid slope is decidedly different in type from that of the Atlantic coast. In some respects it is more varied.

The landscape of the Pacific side of the Isthmus has been somewhat modified by man, for this region has always supported the major portion of the population, and the digging of the canal brought about conspicuous changes in the topography. The canal itself, including Balboa Harbor, occupies a large area, and extensive cuts and fills were necessary to prepare habitable town sites. Part of the present site of Balboa and Fort Amador was formerly a swamp, which was filled with earth excavated from the canal and deposited so as to form a wide level area. A good-sized portion of Ancón Hill was blasted away to supply rock and gravel for construction purposes.

In the immediate vicinity of Panama City the appearance of the country probably has not been altered so greatly since settlement by Europeans. Although the city with its suburbs spreads far inland, the amount of land under cultivation is much less than might be expected, in view of the market close at hand for agricultural produce. The soil seems not to be very rich, and some of it is altogether too sterile for profitable tillage. The landscape about Panama must have been originally very much as at present—grassy savannas interspersed with small woodlands, with dense forest and jungle in the swampy depressions.

For a long distance toward the northeast, the direction in which Panama will naturally develop, the topography is comparatively level, hills of much size existing only at so remote a distance that they are almost inaccessible. Southward from the canal the country is somewhat different; there is little or no level land, but a mass of low hills, uninhabited within the zone. Along the near-by coast the rocky hills support a rather meager vegetation of shrubs and low trees, like that about Bella Vista or on Taboga. Farther southward there are native villages, such as Arraiján, which are centers of farming communities. The vegetation of the latter region, still unexplored, is probably not of special interest.

The most conspicuous scenic feature within the zone at the Pacific end of the canal are two hills, Sosa and Ancón, the latter, which is much the larger, long a well-known landmark. Ancón Hill, with an altitude of about 600 feet, covers only a small base, hence its sides are steep. On its western side, where rock has been quarried, they are precipitous and overhang Balboa and Quarry Heights. There is no indication that the vegetation of this hill has changed greatly during the past 400 years, except as some of the trees may have been cut for firewood. Even this is doubtful, because the sides are so steep that woodcutters would naturally prefer to prepare firewood and charcoal in more convenient places. There is at present a military road for vehicles which ascends almost to the summit.

From a botanical standpoint Ancón Hill is a locality full of surprises. It is a small hill, easy to climb, and accessible in only a few minutes from Panama, Ancón, or Balboa. Nearly every botanist visiting the Isthmus must have ascended it, yet its flora seems inexhaustible. During several short excursions to the summit I found a few species not previously reported from this part of Panama, and one new to science; Piper collected here one or two plants unknown elsewhere in the region; and only recently I have received from Johansen specimens of another tree new to the Canal Zone, collected on this same hill.

There is no obvious reason for such a localized flora. On the lower slopes of Ancón Hill all the original vegetation has been destroyed to make room for buildings, and in the unoccupied places about its base there are only the usual guarumos and balsas, with other weedy trees and shrubs. Along the northwestern slope, extending nearly to the top, there are remnants of forest hitherto little disturbed except by the annual grass fires. Several of the trees are interesting, *Vochysia*, for example, besides other species of rare occurrence elsewhere. In these residual groves one happens every now and then upon some shrub or herb which previously has eluded collectors. Such a plant is *Selenipedium*, one of Panama's rarest and strangest orchids, an herb sometimes 10 feet high, discovered here a few years ago by Killip.

On the steep slopes above the groves of trees stretch patches of grassland whose flora is essentially that of the savannas beyond Panama. It is curious, but perhaps not especially significant, to find on a hilltop this savanna flora. The same type of vegetation exists also on the high slopes of Taboga Island, for Ancón Hill is almost a replica of the hills of that island, to which it must be closely related geologically. On the steep grassy slopes of Ancón Hill there is a profusion of sedges and grasses, interspersed with many small herbs and shrubs. Among the latter are such plants as *Declieuxia mexicana*, *Psidium oerstedeanum*, *Eupatorium amygdalinum*, and *Curtia tenella*, all of which are essentially savanna species, represented also on the upper slopes of Taboga but unknown in the savannas beyond Panama. There are on Ancón numerous species common to the latter region. Of the trees and shrubs found on the hill, several are known in the zone only from this locality, notably *Persea caerulea*, *Ouratea nitida*, *Miconia ciliata*, and *Henriettea succosa*.

Sosa Hill, the companion to Ancón, is much lower, and botanically uninteresting. It has been cleared and some of it is under cultivation.

Northward from Balboa, toward the Continental Divide, about Corozal, Paraíso, and Summit, rise lower hills, few of them with more than vestiges of their natural vegetation. They are distinctly arid in many places, at least during the dry season, and support a mediocre flora. Guarumo trees are conspicuous, with wild figs, Bombacaceae, *Cordia alliodora*, *Roupala*, *Triplaris*, *Gliricidia*, *Apeiba tibourbou*, cuipo (*Cavanillesia*), and a great number of other species. Brushy thickets are of general distribution. The farther the hills recede from the canal the more humid seems the forest. Thus, back of Fort Clayton, or in the ravines between Summit and Pedro Miguel, there is comparatively wet forest, with a fair number of interesting plants. Close to the canal in this same region a great deal of the land has been cleared for pasture and is overgrown with Guinea grass, the native vegetation thus having been wiped out.

A good collecting ground is that along the Paraíso River and its tributaries, near East Paraíso, between Summit and Pedro Miguel. Although ineffective clearings have been made by West Indians for their patches of plantains, bananas, and cassava, most of the slopes remain covered with essentially virgin forest. There are several small watercourses over whose rocky beds one can walk in the dry season as if upon a concrete pavement. Of particular interest in these streams is the great abundance of *Tristicha*, one of the Podostemonaceae, whose appearance is suggestive of certain aquatic mosses. In many places the plants form dense mats, 1 or 2 inches thick, over the flat rocks which constitute the stream beds. They adhere so tightly to the rock surface that it is almost impossible to detach them entire. In the bordering forest there are probably a good many scarce plants to reward a patient collector. The showiest plant noted here is a rubiaceous tree, *Pogonopus speciosus*, splendid in the display afforded by the purple-red bracts of its inflorescence. Many of the large trees are burdened with a prolific growth of epiphytes, the orchids, especially, having been disturbed here less than elsewhere.

The swamp which was filled when the site of Balboa was prepared must have contained a few plants that no longer exist in the vicinity; at least, several species found by Seemann have not been observed by recent collectors. Along the canal as far as the first locks at Miraflores the influence of the tide is evidenced by salt marshes and mangrove swamps. In the latter grows a rare shrub or small tree of the Tea Family, *Pelliciera rhizophorae*, discovered by Seemann. Back of the mangroves extend marshes filled with coarse sedges and grasses and pure stands of *Acrostichum*. Over some of the saline flats spread mats of *Sesuvium portulacastrum*, *Sporobolus virginicus*, and other salt-enduring plants.

About Balboa there are scattered patches of ground cultivated sporadically as vegetable gardens. When these are abandoned there springs up a varied assortment of herbaceous plants, such as *Corchorus*, *Meibomia*, and *Sida*. With these weeds several common garden plants persist long after cultivation has ceased—cassava, yams, okra, and hyacinth beans.

For the botanist the most productive part of the Pacific slope of the Isthmus is the territory beyond Panama City, easily reached by trolley line to Las Sabanas, and by good asphalt roads, over which run frequent buses.

Just beyond Panama is Bella Vista, the exclusive residence section and the favorite bathing beach. The shore is for the most part rock-bound, with beds of porous black volcanic rock extending far into the water, but in a few places the rocks give way to beautiful wide beaches of dark, firmly packed sand. Tide limits in Panama Bay are so extreme that at low tide broad slopes of rock and sand are exposed far seaward. The shore vegetation here, rather unlike that of the Atlantic coast, is decidedly xerophytic. There are, it is true, the usual mangrove swamps invading the estuaries of the streams with a dense growth of interlaced branches. These swamps are utilized by charcoal burners, since mangrove charcoal is preferred to all other kinds for use in kitchens.

On the rocks that often border the coast is a narrow belt of thicket, consisting of a mixed association of shrubs and small trees, many of which are armed with spines. Mesquite (*Prosopis chilensis*) is frequent, likewise a few vinelike cactuses, *Erythroxylon mexicanum*, *Celtis iguanaea*, *Pisonia aculeata*, and a bullhorn acacia (*A. costaricensis*). Herbaceous plants are plentiful but of rather ordinary kinds. The edge of the sandy *playa* nearly always is fringed with poisonous manchineel trees (*Hippomane*), rather pleasing in appearance to one ignorant of their dangerous nature, for their clean trunks and smooth pale bark are really handsome.

Between the coastal thickets and the low hills skirting the mountains spread the savannas. Before visiting the Canal Zone my curiosity had been aroused by the constant references made by Seemann to the "savannas of Panama," where he found so many interesting plants, suggestive of a flora unlike any known elsewhere in Central America. In Central America such savanna regions exist only in Panama and southern Costa Rica, and in Panama they are much more extensive, being, according to verbal information, even better developed farther toward the Colombian frontier than about Panama City.

To the botanist the Panama savannas are an alluring field for investigation. In their appearance, as well as in their composition, they suggest a temperate flora rather than a tropical one, although the grassland type of vegetation is well displayed elsewhere in the American tropics, the Panama savannas resembling those described for Trinidad, Guiana, and Brazil. Upon a miniature scale they imitate the prairie of the western United States. The land is level or rolling, and if well drained is mostly covered with a velvety carpet of grass. This grassland is not continuous as on the prairies, but is broken at short intervals by wooded swamps. Some of the swamps, especially those near the sea or toward the hills, are extensive, but many are small, less than a hundred yards long. In general effect the landscape is parklike, the more so because the savannas are used for grazing purposes and usually are closely cropped.

In the rainy season the grassland becomes a beautiful bright green sward, in which close search discovers an unexpected variety of dwarf herbs, such as Crotalarias, Mimosas, *Stylosanthes*, Zornias, Borrerias, and Diodias. A good many plants are known in Central America only from these savannas, and a few of the species are endemic. Among the latter is a small white-flowered composite, *Melanthera microphylla*, one of the few clearly distinct species of this genus. Many of the herbaceous plants of the savannas are much reduced in size, consequently there is always the possibility of a new find if one searches diligently among the grasses. *Burmannia capitata* is one of the most tenuous plants, so delicate and colorless as to escape all but the keenest eyes.

An occasional rivulet meanders across the savannas, supplying water for the cattle, and there are little boggy spots that yield strange aquatic plants—several species of *Bacopa, Mayaca, Eriocaulon, Sauvagesia pulchella, Centunculus, Lophotocarpus, Salvinia, Marsilea,* local grasses, *Ilysanthes,* etc. If these reduced bogs are to be seen in prime condition they must be visited during the rainy season or soon after, when they are saturated with water. Almost immediately after the rains cease they dry and become as parched as the surrounding grassland.

Near Matías Hernández there are a few hundred acres of open boggy land, one portion of it lying along the road. There is found here a plant association which is evidently distinct from any occurring elsewhere. Although there is always a little water over these level fields one may walk through them with little inconvenience and collect many bog plants. In early morning they are brilliant with the showy pink blossoms of *Schultesia,* one of the most superb gentians and one of the most delicately colored flowers of all Central America. At appropriate seasons of the year these bogs are decorated with thousands of spikes of a green-flowered *Habenaria,* and there is an abundance of such plants as *Sesbania emerus, Aeschynomene sensitiva* and *A. hispida, Phyllanthus diffusus, Kosteletzkya,* and *Melochia melissaefolia.*

Continuing northeastward from Panama City the paved road crosses the Río Abajo, near Juan Díaz, and ends at the Tapia River. A walk or ride of a few miles over a good dirt road brings one to the Tecumen River, and the road continues to Chepo. All these rivers are small streams, usually too wide to jump across but so shallow as to be waded easily. During the dry season, at least, the water is clear and warm, with a rather rapid current. In the rainy season their volume is increased, but apparently the water never spreads far beyond the banks.

These streams are most notable for a curious fish that inhabits them in abundance. If a bit of bread or even of some quite inedible substance is tossed into the water, it is attacked instantly by dozens of ferocious little fish, like minnows, which swarm from every side, and leap out of the water in their eagerness to get food. If one enters the water to bathe they nibble at the skin, and the greater the splashing to drive them away the more numerous and persistent they become. They are too small to puncture the skin, but their onset is startling to one unacquainted with their habits.

Beyond the Tapia there is scarcely any cultivation, at least in the part of the region I have seen, but a good many cattle are grazed. The savannas here, toward Chepo, are somewhat different from those nearer to Panama City. Whether they represent the primitive condition of the latter or are essentially different is uncertain. There are many plants in the savannas close to Panama that I have never seen in those beyond the Tapia, and vice versa.

In the Tapia region the topography is similar to that near Panama City, but the vegetation of these savannas, naturally, is much more luxuriant because it is less intensively grazed. Here there are several local grasses as well as many species of *Hyptis* and other herbs which do not occur closer to the capital. The herbaceous vegetation which covers the parklike openings so densely is mostly one to three feet high, and there is none of the fine close sod that characterizes the Panama savannas.

The swamps amid all these savannas, together with the low wet lands along the streams, yield the usual variety of tree species. In the groves near the city most of the trees are small, yet in the pastures there are huge corotús or ear-trees (*Enterolobium cyclocarpum*), in whose generous shade the cattle rest during the heat of the day. A few palms, mostly corozos (*Attalea gomphococca*), lend variety to the landscape. The tree species are so diversified that it is difficult to fix the attention upon them, but among the more abundant or striking are *Hymenaea*, *Coccoloba caracasana*, *Annona purpurea*, *Nectandra globosa*, *Licania platypus*, raintree (*Pithecolobium saman*), *Cassia moschata*, *Erythrina glauca*, Spanish-cedar (*Cedrela fissilis*), nance (*Byrsonima crassifolia*), *Sloanea quadrivalvis*, *Luehea seemannii*, *Bombax barrigon*, Panama tree (*Sterculia apetala*), and *Sciadodendron excelsum*. The Vismias are abundant shrubs of distinctive aspect. A *Bauhinia* often forms dense spiny thickets. Two malaguetas (*Xylopia*), neat shrubs or small trees with glossy, dark green, two-ranked leaves, are prominent in the thickets. Large *Inga* trees attract attention because of their bunches of creamy-white flowers and their heavy pendent pods. These groves and thickets are disappearing rapidly. Even the swamp land is being cleared for pasture, an important dairy industry having developed here.

It was at the edge of these savannas that the first settlement on the Pacific coast was planted, Old Panama, deserted after it had been sacked by Morgan for the present site, which is certainly preferable in every respect. The ruins of Old Panama, especially the tower of the cathedral, are a Mecca for tourists. Whoever has visited them and suffered the swarms of mosquitos that infest the surrounding swamps will not regret the removal of the city to its present location.

Great changes have taken place in this region in late years. Half a dozen years ago there was virgin forest near the village of Juan Díaz, but practically all of it has now been felled. In 1924 an untouched forest area along the Tapia River, which I visited several times, yielded several new species, but in the spring of that year most of this was cut. Now one must go farther afield if in search of plants. The cleared land is being utilized for agricultural purposes. This is exceedingly desirable in an undeveloped country like Panama, where one is impatient of the little attention given to agriculture, but the botanist must regret the destruction of such convenient collecting grounds. As the road to Chepo is improved, the rest of the forest will gradually disappear, and at no very distant day all this part of the Province of Panama will assume the agricultural importance that it deserves.

In the narrow belt of alluvial land bordering the Tapia and Tecumen Rivers there are, or were, innumerable tall trees, lavishly infested with epiphytes, although in no very great variety. High on the larger trees are showy clumps of Epidendrums and other orchids, crowded among bromeliads, masses of ferns, and aroids. *Pera arborea* is one of the most abundant of the big trees; others are *Terminalia hayesii*, *Dipterodendron costaricense*, and espavé (*Anacardium excelsum*). Among the shrubs are several rare Annonaceae: *Annona acuminata*, anomalous because of its dehiscent fruit, and *Anaxagorea panamensis*, an endemic species. One of the most plentiful shrubs is *Siparuna pauciflora*. At the edge of the water there are almost always sota-caballo trees (*Pithecolobium vahlianum*), whose widely spreading branches strew their pink flowers over the dark pools, and there are several lauraceous trees with rich green foliage.

In the muddy forest along the streams perhaps the most abundant plant is the pita floja (*Ananas magdalenae*). Its long tough spine-margined leaves form impenetrable thickets of ample extent, which afford a secure retreat for the many small animals of these jungles. In the sticky red clay soil that is overflowed at high water there are colonies of otó de lagarto (*Dieffenbachia*), an erect aroid with milky corrosive sap, and coarse ferns, such as Tectarias and *Dictyoxiphium*.

I once visited an unusual locality some miles beyond the Tecumen River, an open swamp with an area of several square miles. This swamp is unique in the region, so far as I know. As a rule, the larger swamps are densely overgrown with trees and shrubbery. This one is a paradise for alligators, and an ideal natural sanctuary for water birds, whose cries fill the air. The long-legged jacanas stride gracefully over the water plants, their steps so light as scarcely to stir the leaves. Thousands of white herons share the place with them. The swamp lies close to the sea, and the roar of the surf is heard plainly to the southward. The whole great area, filled with water waist deep, is devoid of trees but contains isolated clumps of bushes. The herbaceous vegetation consists of small islands of coarse grasses and sedges, with *Thalia*, Cannas, Jussiaeas, and other rank herbs, about which float most of the aquatic plants known from Panama.

All this vast region beyond the Tapia will prove interesting botanically when it can be reached, for it has been little disturbed by man. The wooded swamps, if they could be explored thoroughly, would enrich the flora with a great many new or otherwise interesting plants. Spanish-cedar (*Cedrela fissilis*) and *Guarea* (*G. guara*) trees are plentiful in the swamps, likewise *Zanthoxylum,* and a handsome lythraceous tree, *Lafoensia punicifolia.* The tree tops often are draped with bignoniaceous vines, which in their season provide bright masses of color. Strikingly beautiful is *Arrabidaea pachycalyx,* whose myriads of flowers form a mantle of rich purple in midwinter over many of the large trees of the swamps.

The greater profusion of showy flowers on the Pacific slope is one of the features which make this side of the Isthmus more attractive and interesting than the Atlantic coast. There is keen rivalry between the residents of the two coasts as to the merits of their respective regions, but an impartial observer will agree that the majority of the inhabitants chose wisely when they elected the Pacific slope, with its more varied landscape and its incomparably superior climate.

FLORA OF TABOGA ISLAND

Taboga Island is not a part of the Canal Zone, but it is too closely associated with the canal to be excluded from the present treatment. Although of no great extent, it is the largest of the islands of Panama Bay, lying about 10 miles off the shore. It is from every standpoint one of the most interesting localities of the Isthmus, particularly because it is more typically Latin or Central American than any other place that a visitor to the zone is likely to see.

Taboga has long been one of the best-known stations of the Pacific coast. For centuries it was visited by ships which anchored to take on water, which here was of better quality than that to be obtained elsewhere along the coast. The island has a more agreeable climate than the mainland, and the merit of being free from malarial mosquitoes. During canal construction days the United States Government maintained here a sanitarium for convalescent patients from Ancón Hospital. Part of the buildings formerly so used have been destroyed by fire, but the remaining portion now serves as a hotel. A few residents of Panama City have cottages on the island, where they pass their vacations.

Taboga is a rugged mass of rocky hills, which rise from the sea to a height of nearly 1,000 feet, and constitute the most elevated land in the neighborhood of the zone. There is practically no level ground, but parts of the steep slopes are fit for cultivation. In general the shores are rocky, yet in sheltered coves there are delightful beaches which afford facilities for bathing.

The whole population of Taboga is concentrated in a single settlement, a sleepy little village situated on the shore facing the mainland. The small bay is not large enough to protect shipping, and its water often becomes very rough in late evening with the strong offshore breeze. The town, with its low white stuccoed buildings, is quite unlike Panama or Colón, two cities which have little in common with others of Central America.

The people also are distinctly different from those of the mainland, especially because they speak only Spanish. They have two occupations, fishing and agriculture. Taboga is noted locally for its vegetables and fruits; above all, for its pineapples, which, being practically the only good fruit grown in the region (except papayas, in which Panama is unequaled), have perhaps an even higher reputation than their quality justifies. The villagers have small patches of cultivated ground on distant parts of the island, going out each day to tend them. The plantations of pineapples are the most important and extensive, but there are many fruit trees of different kinds and, strangely enough, even a little coffee is grown for local consumption. It is rarely that coffee is planted in Central America at sea level.

On the main peak of Taboga there still remains some forest, and, although the island is well drained and the climate comparatively dry, this forest is rather wet, conserving a few small springs and insignificant trickles of water, about which grow tree ferns. The forest has not been well explored, nor the vegetation of other parts of the island, for that matter, and it is likely that a good many additional species would be revealed by a thorough search of the hillsides.

The most interesting part of the island botanically is the hill at the eastern end. Its vegetation is almost identical with that of the top of Ancón Hill, but is developed upon an ampler scale. The soil of the hilltops is apparently too sterile for cultivation; at least, it is not utilized for agriculture. The steep slopes support a sparse growth of stunted bushes, especially sandpaper-tree (*Curatella*) and nance (*Byrsonima*), with others still smaller, among which *Psidium oerstedeanum* is conspicuous. The denser part of the plant covering consists of a thick growth of low wiry grasses, which in the dry season make the steep slopes so slippery that ascent is difficult. Among the herbaceous plants noteworthy species are sedges of several genera, *Cassia tagera, Crotalaria pterocaula, Indigofera lespedezioides, Zornia diphylla, Sida linifolia,* species of *Evolvulus* and *Buchnera, Eupatorium amygdalinum, Tephrosia nitens,* and *Clitoria guyanensis.*

The whole aspect and composition of the flora is essentially that of the savannas, yet there grow here a few plants absent from the level savannas, and in the latter there are many species not found on these exposed well-drained slopes. Characteristic plants occurring here (some of them also on Ancón Hill) but absent from the savannas, are *Curtia tenella, Psidium oerstedeanum, Eupatorium amygdalinum, Aeschynomene hystrix,* and *Clitoria guyanensis.*

Attention is directed primarily to the several species growing on Taboga that are unknown elsewhere in the immediate region. Among these may be mentioned *Scleria secans, Capparis odoratissima, Acacia riparia, Tephrosia nitens* (reported from Frijoles, but probably in error), *Aeschynomene hystrix, Clitoria guyanensis, Acalypha villosa* and *A. alopecuroides, Miconia rubiginosa, Malvaviscus arboreus,* and *Tithonia rotundifolia.* Some of these, especially the Acalyphas, *Malvaviscus,* and *Tithonia,* are abundant on Taboga, and both *Acalypha villosa* and *Malvaviscus* are weedy shrubs common elsewhere on the Pacific coast of Central America.

The other islands of Panama Bay are unknown botanically. Most of them are too small to furnish more than a few species, but Taboguilla is large enough to supply, perhaps, some records of interest. Even from a distance, as one passes on a boat, there may be discerned on several of the small islands the massive leaves and treelike inflorescences of the only century plant known from the region, *Agave panamana.* Most of these islets are composed of rugged rocks, which afford admirable breeding grounds for the flocks of sea birds inhabiting them.

DISTINCTIVE ELEMENTS OF THE ATLANTIC AND PACIFIC FLORAS

The floras of the two continental slopes of the Isthmus differ not only in their general appearance but also in the actual genera and species of which they are composed. There are many genera represented only on the Atlantic slope, and many others confined to the Pacific watershed. A similar localization of genera and species characterizes these two slopes throughout Central America.

Perhaps the most conspicuous element of the local Atlantic flora is the great abundance and variety of palms. Most of the Panama genera are found only in the forests of this slope. The Araceae also are more plentiful, as well as most of the other families in which epiphytes predominate, and, in general, those groups which thrive best with an abundance of moisture are better represented in the wet forests near the Atlantic Ocean, if not wholly confined to them.

Some of the most important trees and many of the conspicuous shrubs and herbs occur only on this slope. Among the genera thus limited in their distribution are such striking groups as *Montrichardia, Dimerocostus, Hyperbaena, Unonopsis, Guatteria, Desmopsis, Brownea, Prioria, Drepanocarpus, Alchornea, Omphalea, Talisia, Heliocarpus, Tovomitopsis, Rheedia, Symphonia, Zuelania, Grias, Bucida, Malouetia, Odontadenia, Mandevilla,* and *Vitex.* There may be mentioned also such important woody species as *Entada scandens,* *Croton billbergianus*, *Apeiba aspera*, *Theobroma purpureum*, and *Pachira aquatica*. Although it is quite possible that further exploration may discover some of these also on the drier Pacific side of the Isthmus, they will be found to be of infrequent occurrence there.

Many genera and species likewise are confined to the narrow Pacific slope. Grasses and sedges are far more plentiful here than in the wet forests, for they find their most congenial habitat in the extensive grasslands of the savannas and on exposed hillside slopes, like those of Ancón and Taboga. To the savannas are confined such genera as *Stenophyllus*, *Mayaca*, *Eriocaulon*, many of the Mimosas, *Stylosanthes*, *Zornia*, *Eriosema*, *Piriqueta*, *Centunculus*, *Curtia*, *Evolvulus*, several of the *Hyptis* species, *Ilysanthes*, and *Buchnera*. Other genera known only from the Pacific slope are *Agave*, *Leptoglottis*, *Enterolobium*, *Hymenaea*, *Sesbania*, *Bunchosia*, *Bernardia*, *Dipterodendron*, *Matayba*, *Kosteletzkya*, *Acanthocereus*, *Hylocereus*, *Lafoensia*, *Pterolepis*, *Sciadodendron*, *Rapanea*, *Rauwolfia*, *Loeselia*, *Cornutia*, *Duranta*, *Marsypianthes*, *Amphilophium*, and *Tecoma*, besides such important isolated species as *Lysiloma guachapele*, *Pithecolobium saman* and *P. oblongum*, and *Annona purpurea*. Most of these are plants widely dispersed in western Central America.

The number of individual species confined to one or the other of the two slopes is much greater even than the generic examples already cited would indicate. The mere recital of a long list of names of such plants would be of little interest except possibly to the professional botanist, and it would serve no useful purpose to the general reader. It may be of some interest, however, to give a brief list of genera which have some of their species localized on the two opposite watersheds. There are several genera which are represented in the canal region by only two species, one Atlantic, the other Pacific in distribution. In the following table, the species named in the first column are those known at present only from the Atlantic forests; those of the second column are more or less closely related congeners which represent the same genera on the Pacific slope.

ATLANTIC	PACIFIC
Heliconia mariae.	*Heliconia straminea.*
Heliconia curtispatha.	
Heliconia bihai.	
Heliconia acuminata.	
Licania hypoleuca.	*Licania platypus.*
	Licania arborea.
Acacia melanoceras.	*Acacia costaricensis.*
	Acacia farnesiana.
Erythrina panamensis.	*Erythrina rubrinervia.*
Erythroxylon panamense.	*Erythroxylon mexicanum.*
Erythroxylon amplum.	
Allophylus psilospermus.	*Allophylus occidentalis.*

ATLANTIC	PACIFIC
Pavonia preslii.	*Pavonia sessiliflora.*
Pavonia scabra.	*Pavonia panamensis.*
Xylosma panamensis.	*Xylosma hemsleyana.*
Casearia javitensis.	*Casearia nitida.*
Miconia argentea.	*Miconia albicans.*
Miconia nervosa.	*Miconia stenostachya.*
Miconia beurlingii.	*Miconia ibaguensis.*
Miconia lonchophylla.	*Miconia minutiflora.*
Ardisia myriodonta.	*Ardisia revoluta.*
Prestonia macrocarpa.	*Prestonia ipomeifolia.*
Ipomoea stolonifera.	*Ipomoea asarifolia.*
Cordia bicolor.	*Cordia heterophylla.*
Cordia sericicalyx.	*Cordia globosa.*
	Cordia corymbosa.
Cestrum macrophyllum.	*Cestrum latifolium.*
	Cestrum nocturnum.
Solanum salviifolium.	*Solanum allophyllum.*
Solanum hayesii.	*Solanum hirsutissimum.*
	Solanum mammosum.
	Solanum erythrotrichum.
Anemopaegma punctulatum.	*Anemopaegma orbiculatum.*

GENERAL CONSIDERATIONS OF THE ISTHMIAN FLORA

All the Canal Zone region lies within the so-called Lower Tropical life zone, of which there are two main divisions, the Humid and Arid, the former restricted in Central America to the Atlantic slope, the latter chiefly to the Pacific watershed. Our area in both its divisions is quite representative of these subdivisions as developed upon a larger scale farther north in Central America. Since all the Isthmus is low, nowhere exceeding an elevation of 1,000 feet, we can not expect that diversity of vegetation which in other parts of Central America results from a much greater variation in altitude.

The flora of the Canal Zone has been more thoroughly explored than that of any other part of Central America, of some of whose countries, indeed—Honduras, British Honduras, and Nicaragua—we know almost nothing. It is therefore possible to form a somewhat comprehensive idea of the relative rank and of the relationships of the Isthmus flora.

About 2,000 phanerogams are recorded from the Isthmus, a number which, though surprisingly low, probably can not be quite equaled by an area of the same size in the United States. The flora of the Pacific slope of the Canal Zone compares favorably in variety with that of the Pacific coast of northern Central America; but that of the Atlantic slope is, I feel sure, much less varied than the lowland flora of near-by Costa Rica, and probably the flora of other parts of the Atlantic watershed of Panama, such as Bocas del Toro and the San Blas coast. One would have every reason to expect on the

Atlantic coast a much greater number of species than has been found thus far.

Furthermore, one is forced to regard the flora of the Canal Zone as uninteresting in comparison with that of other parts of Central America. There are, admittedly, numerous endemic species and some plants that do not range farther northward, but so there are in any part of Central America. The number of really interesting plants is much smaller than one will find in an equal area on the coast of Costa Rica or Guatemala, and it is astonishing that the vast amount of botanical exploration carried out in the Canal Zone since 1911 has resulted in the discovery of so few new species; an equal expenditure of effort in any other part of Central America would probably have disclosed a much greater number. This exploration has demonstrated the presence of many plants not reported by earlier collectors; nevertheless most of these are species widely distributed in Central America, the West Indies, or northern South America, whose occurrence here was to have been expected.

The limited number of species is explained partly by the low altitude and the restricted area, but the representation here of both the Atlantic and Pacific floras should compensate in part for these limitations. The lack of diversity in the flora is due partly to the extensive changes wrought here by man, especially during the construction of the canal. That undertaking involved the destruction of much of the forest and of many of the swamps. Agricultural developments have been responsible for the disappearance of additional forest, with which have vanished some of the most favorable places for plants. The remaining amount of virgin forest near the canal is small and the flora correspondingly limited. Land formerly stripped of its forest is overgrown with weedy shrubs, small trees, and herbs, or with coarse grasses, among which nothing of special botanical interest may be expected.

In spite of all this, the zone has much to entertain the botanist, especially one unacquainted with tropical vegetation as it exists elsewhere. The stranger from the United States finds enough new and curious types to hold his close attention for weeks or months. Nowhere else in Central America will he see the grotesque cuipo (*Cavanillesia*) trees, nowhere else so easily accessible the beautiful savannas, and in few places such a luxuriant growth of those overgrown herbs, the Heliconias.

The relationship of the flora of the Isthmus is undoubtedly very close to that of other parts of Central America, hence the botanist familiar with even a country so distant as Guatemala will find little that is strange to him. The importance of the Isthmus of Panama as a barrier between the floras of North and South America has been greatly exaggerated, for its comparative unimportance becomes every day more apparent as exploration continues in Colombia and Central America. The montane flora of Costa Rica, for example, evidently is closely related to that of Colombia and Ecuador. If the species are not identical—as is often the case—their genera are the same. Field work during the past few years in eastern Panama has discovered South American genera unknown north of the Isthmus, and there are many Central American genera which have not yet been found south of the canal. But the ranges of genera and species must end somewhere, and a similar record could be established for Nicaragua or Honduras.

Recent work in Guatemala and British Honduras has demonstrated the existence there of several genera or even species otherwise unknown north of the Guianas, and in Costa Rica have been found South American plants not yet reported from Panama. Detailed exploration along the neglected Atlantic coast will reveal a closer affinity between the flora of the Guianas and that of Central America than is now conceded.

The vegetation of the Atlantic slope of the Canal Zone is very like that of the whole eastern coast of Central America, as far north as Guatemala, and it must be closely similar to that of the humid Pacific coast of Colombia. The flora of the Pacific slope of this portion of Panama is so much like that of Costa Rica, Salvador, and Guatemala, that one would scarcely notice the difference, were it not for the savannas that exist in the former region; but these occur also in southern Costa Rica. The plant growth of the Pacific coast of tropical North America is remarkably uniform, even as far north as the State of Sinaloa in Mexico. It is nearly allied also to that of the dry Atlantic coast of Colombia and Venezuela.

The closeness of this relationship has been insufficiently appreciated by botanists of the United States because heretofore there has been scant South American material in American herbaria, and the quantity accessible now is sadly inadequate. As the floras of Central America and northern South America are studied with ample herbarium material, a gradual correlation between the published species of the two regions will be possible, and more than a few of them will be found identical. The described species of Central America and the West Indies likewise have not been compared with sufficient pains, and the student of either flora frequently finds the same plant described from each region under a distinct name. In tropical America we have the same condition that still exists to a great extent in the United States: The flora has been studied from isolated centers, with little regard for the species accepted at other centers, but with the assumption that each area is floristically distinct. Correlation through monographic work, covering a group throughout its range, will reduce the species that have been multiplied unnecessarily. Such critical monographic work is scarcely practicable in the preparation of a flora of a limited region.

INTRODUCED PLANTS

In a territory so long occupied by people of a foreign race, and always in communication with remote parts of the world, it is natural to expect a fair proportion of introduced plants, that is, plants which have become established more or less accidentally. A few Old World species are thoroughly naturalized as weeds in Central America, but most of them are inconspicuous and unimportant. For the Canal Zone may be mentioned *Vernonia cinerea,* the Emilias, the species of *Achyranthes, Amaranthus gracilis,* and *Cyathula prostrata.*

Numerous other species have the appearance of being adventive locally, but are in reality native of some part of America. Some of these are confined to cultivated areas or dooryards, and one wonders what may have been their habitat before the advent of man. One such plant is *Chenopodium ambrosioides,* which seldom grows far from houses. There are also garden plants which, although believed to be natives of Mexico and Central America, are unknown in a wild state. Examples of their class are the four-o'clock (*Mirabilis jalapa*), the poinsettia (*Euphorbia pulcherrima*), *Jatropha podagrica,* ornamental marigolds (*Tagetes*), and zinnias. Where did they originate? They must have been under cultivation for many centuries, but the wild types from which they sprang seem to be no longer extant. It is believed by some who have considered the subject that the parent plants were exterminated when there were cleared for farming vast areas long since abandoned by man, but even making every allowance for very extensive clearings, it is hard to believe that all the wild plants of a species would have been lost.

Some of the important economic plants imported to Panama have escaped from cultivation and become naturalized. Best established is the mango, which is found abundantly far from settlements, and has every appearance of being indigenous, as the native people claim. One day I made an excursion along the old Spanish road leading from Panama to Las Cruces. This road well deserves a visit, for it is an impressive monument to the stability of public works of colonial days. It is a narrow trail, paved with stones still in order; and particularly neat are the drainage gutters which cross it at intervals. All along this famous route there are many mango trees, and it is easy to guess how they were planted.

Wild limes grow in jungles remote from any settlement, and sour orange trees are scattered in the forest. The home of the coconut is a moot question, which it is not necessary to discuss here, but if the coconut is an introduced plant it has now become thoroughly naturalized in Panama. Its absence would remove the most picturesque element of the coastal vegetation.

Often in the jungle one happens upon such plants as the Chinese hibiscus, the common dracena (*Taetsia*), and other ornamental plants, marking the sites of former dwellings. Relatively few exotic ornamental plants, however, are able to withstand the competition of the indigenous vegetation.

The long list of imported plants cultivated in Panama includes practically all the edible and ornamental kinds that occur commonly in tropical America, such as the banana and plantain, cassava, sweetpotato, maize, peppers, sapodilla, orange, and coffee. I do not believe that any of the food plants of the zone are indigenous in Panama, or at least in the region of the zone. Immediately after the discovery of the New World the Spaniards introduced many food plants to enrich the resources of their colonies. Such plants as sugar cane, oranges, bananas, and plantains must have been transported to Panama very early in the sixteenth century. Other important food plants like beans, sweetpotatoes, and cassava, although not native here, were cultivated long before the arrival of the Spaniards. To the African slaves America owes a few economic plants, particularly yams, which probably reached Panama by way of the West Indies.

There is probably no region of Central America which exhibits so mediocre a selection of horticultural or ornamental plants as does this part of Panama. Scarcely one garden plant of any special interest is seen about Panama City, all those planted being the most ordinary and widespread tropical ornamentals. These, it is true, are grown in quantity and often effectively. The wholesale plantations made by the United States Government about the zone towns consist of monotonous repetitions of hibiscus, bougainvillea, crotons (*Codiaeum*), and *Nothopanax*.

The sole exception, except for the plants grown at Summit, which are mentioned elsewhere, is the choice variety of trees and shrubs scattered about Ancón Hospital. The best of them are a heritage from French days, it being stated that the plantings were made about 1882 under the direction of the mother superior of the Sisters of St. Vincent, who had charge of the hospital at that time. The several rare species represented by well-grown specimens on the slopes of Ancón are worth special attention. They include dozens of unusual plants, among which are large teak trees, many handsome palms, and various exotic figs. The value of the plantations is enhanced by the fact that the plants have been accurately labeled by Mr. Johansen, who has published a guide to the plantings in Ancón and Balboa.[4]

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[4] A handbook of the principal trees and shrubs of the Ancón and Balboa districts, Panama Canal Zone. 1925.

CRYPTOGAMIC PLANTS

The cryptogamic plants of Panama still await study, and none are included in this enumeration. Ferns are abundant, especially on the Atlantic slope, the large number of species and genera represented including a host of interesting forms. Tree ferns add a conspicuous and beautiful element to the vegetation of some localities on the Atlantic slope, where Adiantums, Tectarias, the genus *Dryopteris*, and many other groups are well represented.

Of the lower plants we have scant data. Certain groups of fungi have been studied by Prof. F. L. Stevens, of the University of Illinois, and Prof. C. W. Dodge, of Harvard University, but little or nothing has been published concerning their collections. There must be enough fungi growing about the zone to form a long list.

Mosses and lichens are poorly represented, apparently, and hepatics seem to be scarce. These three groups, like the ferns, are all plentiful in Central America, but they develop best at much higher elevations than any existing near the canal.

AGRICULTURE

It would be entertaining to read a history of the development and progress of agriculture in Panama, beginning with its origin in preconquest days and extending through colonial times to the present. It is improbable that the most careful search through books and unpublished manuscripts would shed appreciable light upon the subject.

At the time of the conquest the aborigines lived very much like the Indians who are still found in large numbers in remote parts of Panama in a primitive state, scarcely touched by civilization. They depended for food upon fish of the sea and rivers, and upon mammals, reptiles, and birds hunted with poisoned arrows and blowguns. They were also agriculturists, and must have planted and utilized such plants as maize, beans, peppers, squashes, cassava, cacao, anatto (*Bixa orellana*) which they used for painting their bodies, the sapote (*Calocarpum mammosum*), the avocado (*Persea americana*), the custard-apple (*Annona reticulata*), pineapples, and a good many other plants.

To what extent agriculture was developed during colonial days is uncertain, but it is improbable that the cultivation of plant crops was ever a very important industry in the vicinity of the zone, where much of the soil is infertile. The European inhabitants of this immediate region have always been city dwellers, and it is likely that even in the colonial epoch they depended, as they do now, upon distant and more productive parts of Panama for their food. At the present time the actual inhabitants of the zone and the adjacent cities could not subsist for many days if shut off from the interior of Panama. Cattle raising is an industry of some local importance, but agronomy is little developed.

One is astonished to learn that vegetables and fruits must be imported from Costa Rica, Cuba, and Haiti, or even from the United States, and that winter vegetables from Florida are sometimes sold in the commissaries. Although it is evident that quantities of these could be produced locally, there seems to be little tendency to increase their production. In the market of Panama City there is a reasonably good display of vegetables and fruits, but many of them are brought from distant parts of the Republic. Of those grown near home, the best are raised by Chinese gardeners. Their gardens are well worth a visit, if only to note the methods of cultivation, which are strikingly different in detail from those practiced in the States, the cultivation being much more intensive. The vegetables are grown usually in narrow raised beds of well manured soil, and during the dry season their oriental proprietors are busy watering the plants from kerosene tins carried in pairs on a yoke across the shoulders. Some of the vegetables grown are unusual ones, such as the strange forms of cucumbers and their relatives, the Chinese cabbage (*Brassica chinensis*), and the "Chinese spinach" (*Ipomoea aquatica*), a plant closely related to the sweetpotato, whose shoots are used as a vegetable.

The Chinese manage to grow in Panama nearly all the well-known northern vegetables, but other people profess themselves unable to do so. The plantations in and near the zone are for the most part small ones, belonging to Panamanians or West Indians, but in either case there is planted little more than enough to feed the family of the proprietor. Unwieldy bundles of sugar cane are carted to market to be eaten, and wholesale quantities of roselle (*Hibiscus sabdariffa*) for preparing *frescos*, but the inhabitants of the cities do not receive from the local gardeners any important amount of vegetables and fruits. The pineapples and other fruits of Taboga enjoy a high local reputation, but their quantity is inconsiderable.

The most important agricultural development of recent years—and it is a recent innovation—is the culture of bananas for export to the United States. On the Atlantic watershed broad tracts of land about Gatún Lake have been planted with bananas, which have been producing for several years. The fruit is loaded directly upon boats in the lake, the transportation thus afforded being much more economical than in most parts of Central America where bananas are produced for market. The total amount of land now planted with this crop is small in comparison with that utilized in other regions. The quantity of bananas shipped is of importance locally, but it is not important when compared with production in other countries.

In the mountains of Panama, especially westward, coffee growing is a profitable industry, but the region about the canal is too low for coffee. At Las Cascadas Plantation, near the continental divide, there were planted many years ago several thousand acres of cacao. The plantation was for a long time abandoned, and recent attempts to clean the groves apparently have not been altogether successful.

About three years ago there was established by the government of the Canal Zone at Summit, on the divide between the two oceans, a plant introduction garden under the direction of Holger Johansen. The garden has for its object the introduction of new plants with economic or ornamental possibilities, and Mr. Johansen has assembled a really remarkable variety of plants (about 1,000 species), considering the brief time he has been engaged in the work. As a result of this undertaking it is to be hoped that the ornamental plantings of the zone, which attract so much attention from tourists and other visitors, will assume a more instructive and varied character, and that agriculture and horticulture will be so stimulated that they may be a credit to the region. There is an exceptional opportunity for establishing in Panama all the best lowland tropical plants, and for testing new plants which may add materially to the wealth of this and other parts of Central America. When it is remembered that the prosperity of Central America is dependent primarily upon the growth for export of two crops, coffee and bananas, and that the latter industry is threatened with ruin, the importance of diversification in Central American agriculture can not be emphasized too strongly.

VERNACULAR NAMES

The majority of the vernacular names here recorded for Panama have been collected or verified by myself, and many are confirmed by the notes of Henry Pittier, who has had long experience in this field of botanical work. For a good many of the names I am indebted wholly to Mr. Pittier's notes. Because so many of the plants listed range widely in Central America and the West Indies, there have been inserted also the vernacular names reported for other countries of Spanish speech.

Collecting vernacular names is a branch of botanical work neglected by most collectors visiting Central America, and naturally it can not be prosecuted intelligently without a speaking knowledge of Spanish. Even with a reasonably thorough acquaintance with that language it is easy to make mistakes, for the educated native people of Central America themselves differ as to the proper spelling and interpretation of many vernacular names.

A knowledge of the plant names employed in Central America is often useful in identifying inadequate plant specimens, and a full list of such names would indeed be valuable in other ways; for example, to the lumberman, whose operations depend largely upon a familiarity with the local names of the trees. As a rule, the names of trees are much more stable than those of herbaceous plants, doubtless because the special uses of the trees are more accurately and generally known.

Some persons have the impression that in Latin America a plant has an indefinite number of vernacular names, but this belief is ill founded. For many plants the names are uniform almost or quite throughout their range. As examples may be cited the Cecropias, known everywhere in Central America under the name *guarumo*, the Spanish-cedars (*Cedrela*) or *cedros*, and mahogany or *caoba*. The list could be greatly extended.

It is true that in different countries distinct names are used for a certain tree, but this happens with the names of many of the most common articles of everyday life. When we remember that in almost every Central American country, and in Mexico, there is a different word for "boy," a term not understood in any of the other countries, it need not surprise us that things of such comparative unimportance as the wild plants have local names.

The variation in speech in Mexico and the Central American countries is a fascinating study. The differences depend largely upon the stock of the aboriginal inhabitants of the respective regions. In every country there are many local words for common objects, words universally used in each country but without meaning in the adjoining ones. The differences are, I should say, ordinarily much greater than those between the English of England and that of the United States. Aztec influence is widely spread in Central America, certainly as far south as Costa Rica, and many of the articles of daily use bear names of Aztec origin quite distinct from the words used in Spain for the same objects. The Nahuatl or Aztec language was extraordinarily rich in plant names, therefore it is not remarkable to find a large Nahuatl element in the Central American plant vocabulary. This is not true of Panama, however.

Assembling vernacular plant names about the Canal Zone is a difficult and discouraging task. The Spanish spoken in Panama City more nearly resembles literary Castilian and probably is freer from vulgarisms than that of any other part of Central America. No doubt this results from the fact that the local Panamanians have mostly been city dwellers and not agriculturists, and have either descended from natives of the Iberian Peninsula or remained in constant association with them. They have had comparatively little intercourse with the native aborigines, the source from which other

Central Americans have adopted their peculiar words. It is strange that in Panama the intensive mingling of many races for four centuries has not introduced a larger element of foreign words; yet it has had little apparent effect, if we exclude the English of recent years, which threatens to exterminate the speaking of Spanish in Panama City. Dozens of the most important and widely used words of Central America are not understood in Panama City; for example, *petate*, mat, *metate*, grinding stone, *zacate*, grass, *zopilote*, turkey vulture; and even the *frijoles* or black beans, next to maize the most important food of Mexico and Central America, will be sought in vain in the market.

The list of local plant names which may be reported from this region is not a long one. In Salvador in a single collecting season Doctor Calderón and I obtained no less than 1,500 vernacular names, but such a record would be hard to equal elsewhere unless in Guatemala, for the Salvadoreans are exceptionally well acquainted with the plants amid which they live. The people of Costa Rica are far less familiar with their flora.

The main difficulty in obtaining vernacular names of plants about the Canal Zone lies in finding native Panamanians who know the rural districts. Most of the people were born and bred in the city, where their ancestors also have lived for many generations, and have no knowledge of the *montaña* or its vegetation. This is not so true in other cities of Central America, where often it is customary for city dwellers to work in the country at intervals, especially during the coffee harvest.

Those who do till the soil about the Canal Zone are likely to be West Indians, speaking their peculiar dialect of English, if such it may be called, or Colombians. The latter employ Spanish or Indian names, but these mostly the ones current in Colombia and not indigenous in Panama. Doubtless a very different condition prevails in the interior of Panama, where there is a native agricultural population.

It is therefore with some feeling of satisfaction that there is presented here the list of vernacular names procured in Panama, even though it is not so extensive as might be desired. Doubtless there are mistakes in the names listed, for this is certain to be true of any extended list. Even the best-informed native people are liable to confuse two plants which seem similar to them, if not to the eyes of a botanist. The majority of the names cited have been checked with two or more informants, and I have had the valuable criticism also of James Zetek, who has had many years of experience in study of the natural history of Panama.

As a whole, the local plant names are decidedly ordinary—what is to be expected in a region where grass is called *paja* (the Spanish word for straw)? There are, however, a few words evidently of Indian origin, and locally indigenous, and many of the names are distinct from those used elsewhere in Central America. Such is *corotú*, which replaces *guanacaste* and its derivatives, employed everywhere else for the ear-tree (*Enterolobium*). The mamey (*Mammea americana*), known generally elsewhere as *mamey*, becomes here *zapote de Cartagena*, while the true zapote (*Calocarpum mammosum*) is *zapote de tierra*. A rich field remains in collating the vernacular names used in the *interior* (as it is called locally) of Panama.

BARRO COLORADO ISLAND

The most distinctive scientific institution of Panama is the Laboratory for Tropical Reseach on Barro Colorado Island in Gatún Lake. This island, the largest of several formed artificially when the Chagres Valley was inundated, and about six square miles in extent, was set aside in 1923 by the Governor of the Canal Zone as a reserve for the perpetuation of the indigenous animal and plant life. Upon the island there has been constructed, chiefly through the untiring effort of Dr. Thomas Barbour and James Zetek, the latter the resident custodian, a substantial laboratory of two stories, with adequate living and working quarters.

The laboratory is administered by the Institute for Tropical Research under the direction of the National Research Council. Maintained by contributions from private individuals and several educational institutions, it has been planned for the use of research workers in natural science who wish to become acquainted with a typical area of the *tierra caliente* of Atlantic Central America.

To a botanist the island is attractive because of its diversified flora, which includes most of the important groups represented on the Atlantic slope, as well as many species that are rare elsewhere. Good trails leading in every direction make the forest accessible to the visitor, who may pass in a moment from the comfort of the laboratory into the virgin forest. For work in many branches of botanical science the laboratory offers advantages of a nature seldom found elsewhere.

There has been issued recently a list of the plants of Barro Colorado Island.[5] The published papers based upon work performed on the island, chiefly by zoologists, are beginning to form an extensive bibliography, which will increase rapidly as the advantages of the island for the prosecution of original studies become more widely known.

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[5] Standley, The flora of Barro Colorado Island, Panama. Smiths. Misc. Coll., vol. 78, no. 8, May 20, 1927.

HISTORY OF BOTANICAL EXPLORATION IN PANAMA

Assistance in the preparation of this chapter has been given to the writer by Dr. J. H. Barnhart of the New York Botanical Garden. Some of the data are extracted from biographical sketches prepared by Doctor Barnhart for publication in a proposed flora of Central America.

Oviedo.—For the first treatise upon the natural history of the New World we are indebted to Gonzalo Fernández de Oviedo (1478–1557), the versatile Historiographer of the Indies. In classic reports made to the Spanish Government by the earliest explorers there are occasional references to the strange products of the New World, but Oviedo was the first who attempted to give a collective account of them.

In 1513 Oviedo was commissioned royal warden to the gold mines of Castilla de Oro, as Panama was then known. Between this year and 1529 he spent much of his time in Panama, but he visited also other parts of America, and became especially well acquainted with the island of Hispaniola. It is stated that he made five visits to America. In his writings he gives a wealth of information regarding Central America, particularly Nicaragua, the Pacific slope of Costa Rica, and Panama, all of which he knew intimately. In 1523 he was appointed Historiographer of the Indies, and from this year until his death he devoted his time to assembling data concerning the history, people, and products of the Spanish possessions beyond the seas.

Oviedo's great work, in which he reported the observations made upon his travels, met the fate which befell so many of the manuscripts prepared in colonial days, and was not published in its complete form until 300 years after his death. Spain had good reason to be jealous of her colonial possessions. The disclosure to her powerful enemies of more information than was absolutely necessary concerning the geography and wealth of her colonies would have been disastrous. Thus it happened that many important manuscripts, prepared at great expense and containing information of the deepest interest to the world at large, were buried for centuries in the archives at Madrid. A striking instance is the work of Francisco Hernández, recently discussed elsewhere.[6]

The first edition of Oviedo's classic work was printed in Seville in 1535 under the title, *Primera parte de la historia natural y general de las Indias.* This rare volume contained only a third of the text as finally revised by its author. The complete work, of four thick quarto volumes, was published in Madrid, 1851–55, with the title, *Historia general y natural de las Indias, islas y Tierra-firme del mar océano, por el capitán Gonzalo Fernández de Oviedo, primer cronista*

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[6] Contr. U. S. Nat. Herb. **23**: 10. 1920.

del nuevo mundo. It consists of 50 books or chapters (19 of which formed the first edition) dealing with the history, geography, peoples, and products of all parts of the New World, but chiefly of Hispaniola and Central America, the regions with which its author was personally acquainted. The *Historia* is invaluable as a source of information regarding the state of the American Colonies during the earliest years of the sixteenth century.

Oviedo has given us a vivid account of the Indians of Panama and of their surroundings. In the botanical section of the work there are constant references to the flora of Panama. There are mentioned such plants as the *xagua* tree (*Genipa americana*), the soapberry (*Sapindus saponaria*), the ceiba trees (Bombacaceae), the membrillo (probably *Gustavia superba,* now known by that name, although the description is not altogether conclusive), the avocado, the spiderlily (*Hymenocallis americana*), and *Chaptalia nutans,* an insignificant composite used medicinally by the natives. It is worthy of note that one tree, the *tempisque,* described at length by Oviedo and so well known in Central America that in Costa Rica there is a river named for it, was not known to modern botanical science until described by Pittier in 1912, under the name of *Sideroxylon tempisque.*

WALLACE.—The earliest recorded collection of Panama plant specimens is one gathered at the settlement of New Caledonia, on the Caribbean coast near the Colombian boundary, by James Wallace, M. D., F. R. S., about 1700. We should scarcely expect to find botanical collections of a much earlier date. New Caledonia was an unfortunate and ill-advised Scotch settlement in an unhealthy region, even to-day uninhabited by white people. It was surrounded by none too friendly Indian tribes and by hostile Spanish settlements, consequently its history was not a long one.

In the Philosophical Transactions of the Royal Society of London for 1700 (pp. 536–543), in an article entitled, *Part of a journal kept from Scotland to New Caledonia in Darien, with a short account of that country,* Wallace gives a sketch of his visit to New Caledonia, from which is taken the following quotation referring to the flora:

> This place affords legions of monstrous Plants, enough to confound all the methods of Botany ever hitherto thought upon. However, I found a shift to make some specimens, and that is all I can do. I say some specimens, because if I should gather all, 'twould be enough to load the *St. Andrew,* for some of their Leaves exceed three Ells in length, and are very broad; besides these Monsters, reducible to no Tribe, there are here a great many of the *European* kindred (but still something odd about them) as *Lingua Cervina* of different kinds, *Filix* of different kinds, *Polypodium,* several of the *Plantae Papilionaceae, Musci, Fungi, Convolvuli,* and a great many more I can not now remember.

The specimens mentioned are still preserved in the herbarium of the British Museum (Natural History), where they form a part of Petiver's Hortus Siccus.[7]

NÉE and HAENKE.—Nearly a hundred years passed before another collection of plants was made in Panama. Luis Née, a Frenchman naturalized in Spain (he is commemorated by the genus *Neea* of the Nyctaginaceae), was one of the naturalists who accompanied the Navigator Malaspina upon his famous voyage around the world, from 1789 to 1794. Née collected plants about Panama Harbor, whose surroundings then must have been strikingly different from those of the present day, though the old landmarks still remain. How many plants Née collected is not known, for his specimens were stored away at Madrid upon his return, and have been little studied. A few from Panama were described as new by Cavanilles. Some of these were collected about Ancón Hill, where they still persist.

Another companion of Malaspina was Thaddeus Haenke (1761–1817), a Bohemian, who, although appointed as one of the naturalists of the expedition, reached Cadiz the day after the ships had sailed. He followed in another ship to Buenos Aires, but was unable to join the expedition until it had reached Chile, he having in the meantime crossed the pampas of Argentina and the Andes, collecting along the way. Haenke and Née subsequently botanized together up the coast of South America and in Panama and Mexico. The former was in Panama in December, 1790, and January, 1791,[8] and it was presumably at this time that Née also made his collections. There is no record of the amount of botanical material collected in Panama by Haenke, but Presl states that "the fascicle of Panama plants proves the diligence of our countryman in this part of the world," hence it is to be assumed that the collection was a good-sized one.

Haenke settled later in Peru, where he died. His specimens are mostly at Prague and Vienna, although some have found their way to other European herbaria. Two large volumes describing the new species gathered on his travels were published by Presl (1830–36) under the title *Reliquiae Haenkeanae.*

BILLBERG.—Johan Emanuel Billberg, a young Swedish physician, accompanied an expedition sent out by Michaelson & Co., of Stockholm, to South America in 1825-26. Billberg visited Porto Bello, Panama, just outside our region, April 13 to 27, 1826, and made an important collection of about 220 plants. Nearly 30 years later, after Billberg's death, Beurling published[9] his *Primitiae florae portobellensis,* the first formal list of Panama plants, based upon this collection. Doctor Dahlin was associated with Billberg in making collections of plants.

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[7] I am indebted to Dr. A. B. Rendle for this information.

[8] Presl, Rel. Haenk. **1**: x. 1830.

[9] Svensk. Vet. Akad. Handl. **1854**: 105–148. 1856.

Of the rather numerous new species described in this paper it has been possible to identify the greater part. Some of the names are synonyms, and a few have not yet been identified, perhaps because they are not represented in the collections available. Some of the plants reported under old names it is impossible to identify without examination of the specimens, since the names are those of plants of other regions which probably do not occur in Panama.

CUMING.—Hugh Cuming (1791–1865), an Englishman, who cruised along the west coast of South and Central America from 1826 to 1831, was interested in plants and shells. Of the former he made extensive collections, but chiefly in South America. Although he is known to have visited Taboga and the Pearl Islands, there are few references to plants he may have collected there.

VOYAGE OF THE SULPHUR.—One of the most famous of the early scientific expeditions to America is that of the British ship *Sulphur*, which left England in December, 1835, crossed the Atlantic to Rio de Janeiro, rounded Cape Horn, and spent about six years cruising in the Pacific, until at Singapore, in October, 1840, she received orders to join the fleet operating in the war with China. During her voyage the *Sulphur* visited Central America several times, and was at Panama from January to March, 1837, and upon one or more subsequent occasions. The naturalists of this expedition were Richard Brinsley Hinds, a surgeon, George Barclay (1810–1842?), a gardener from Kew, and Andrew Sinclair (–1861), a naval surgeon. These three made the large collections of plants upon which the botanical sections of the report of the *Sulphur* expedition were based. A good many species not previously recorded from Panama were reported for the first time in this volume.

VOYAGE OF THE HERALD.—Another celebrated English expedition was that of the *Herald*. Berthold Carl Seemann (1825–1871), born at Hanover, Germany, after a course of study at Kew was appointed naturalist to replace the former one, Edmonston, who had been killed accidentally in Ecuador. Seemann left England in 1846, reaching Panama in September of that year. He spent over three months on the Isthmus before he was able to join the ship, with which he remained until the voyage ended in June, 1851. The *Herald* was at Panama from January to April, 1847, in late April and early May, 1848, and from January 19 to March 19, 1849, ample time for collecting being thus afforded.

In his report upon the botany of the *Herald* voyage (1852–57) Seemann devoted nearly 200 pages (57–254) to a flora of the Isthmus of Panama. In this are described numerous new species, including many of the most important plants of the region, and there is appended an excellent account of the general features of the vegetation. Seemann settled in Nicaragua, where he had an interest in the Javalí gold mines, and he visited Panama upon several later occasions. His collections, the most important of all the earlier ones made in Panama, are in the Kew herbarium, and there are duplicates in the older herbaria of the United States.

WARSCEWICZ.—Many species of Panama plants and two genera commemorate the name of Julius von Warscewicz (1812–1866), who did little collecting in the region of the Canal Zone but deserves mention here as one of the most important of the early collectors in Central America. Warscewicz was of Polish parentage but born at Vilna, Lithuania. He was engaged by Van Houtte of Ghent to accompany a Belgian colony to Guatemala in 1844 that he might collect living plants and seeds for Van Houtte's establishment. He passed several years exploring various parts of Central America and in 1848 visited Veraguas, Panama. In 1850 he returned to Europe but late in the same year sailed for Panama, where he collected about Chagres and again in Veraguas. He introduced into Europe some of the Panama orchids as well as other plants of horticultural value. His collections of dried specimens are at the Berlin Botanic Garden.

FENDLER.—Apparently the first United States botanist to collect extensively in Panama was August Fendler (1813–1883). Although he was born in Germany, he came to the States as early as 1836 and is noted as the pioneer in the botany of New Mexico (1846–47), so that he may be regarded almost as an American botanist. In the winter of 1849–50 he spent four months on the Isthmus. Most of his collecting was done in the vicinity of the little settlement of Chagres, now abandoned, at the mouth of the Chagres River, but he gathered plants also around Panama City. Fendler was a discriminating collector, who discovered many plants that escaped the attention of previous explorers as well as some that have been sought in vain in recent years. He was fortunate in having headquarters in a part of the Isthmus little worked by other botanists before or since his time, and it is perhaps to this circumstance that the special interest of his discoveries is to be attributed.

A fairly complete set of Fendler's plants is in the National Herbarium, and the specimens were distributed to other herbaria. Fendler later made extensive collections in Venezuela and Trinidad. He died in the latter country in November, 1883.

Dr. Mina B. Halsted, an American, collected in Panama as early as 1850, and was there as late as 1854, and may have preceded Fendler.

DUCHASSAING.—Important because it was the basis of a special published report is the collection made in Panama from 1849 to 1851 by Edouard Placide Duchassaing (1815–1873), a native of Guadeloupe who had studied medicine in Paris. During these years he had a sanitarium at Panama, and in his leisure time collected plants in the neighborhood of the city and on Taboga Island. The specimens were sent to Walpers and from him they were purchased by Grisebach, who based upon them his *Novitiae florae panamensis* (Bonplandia 6: 2–12. 1858). In this annotated list a few new species were described.

HAYES.—A comprehensive collection of plants was made about the Canal Zone and elsewhere in Panama by Sutton Hayes, a physician from New York, who visited the Isthmus for his health and died there in 1863. His specimens were forwarded to Kew, and were listed by Hemsley in the *Biologia Centrali-Americana.* A good series of them is in the Gray Herbarium and at the New York Botanical Garden, but there are practically none in the National Herbarium. Most of Hayes's plants probably were obtained close to the railroad, but species not found by recent collectors indicate that he may have visited distant parts of Panama.

HART.—John Hinckley Hart (1847–1911), an Englishman from the botanical department of Jamaica, visited Bocas del Toro in November and December, 1885, and made an important collection of plants in a region then unexplored and still almost unknown. His work has no direct bearing upon the zone flora. A partial set of the plants is in the National Herbarium.

Other botanists who visited Panama during the nineteenth century were Hans Hermann Behr (1818–1904), who collected a few plants about Chagres, probably in 1848; and John Ball, who is reported to have gathered a very few plants in April, 1852. Carl Ernst Otto Kuntze (1843–1907), universally known in the botanical world for his explorations and publications, spent a week in the neighborhood of Colón in 1874. His collections, listed in his *Enumeratio generum plantarum* (1891–1898), are now in the herbarium of the New York Botanical Garden.

EXPLORATIONS OF THE NEW YORK BOTANICAL GARDEN.—John Francis Cowell (1852–1915), director of the Buffalo Botanic Garden, devoted about three weeks to work on the Isthmus in February and March, 1905. His specimens are at the New York Botanical Garden, and a few of the duplicates in the National Herbarium.

Marshall A. Howe, of the New York Botanical Garden, was engaged for a month, in December, 1909, and January, 1910, in study of the marine algae of the region, but incidental to this work he collected also a few flowering plants, one of them being the type of the only *Agave* of the region, *A. panamana,* a conspicuous plant of the islands of Panama Bay.

Of recent collections of Panama plants one of the richest in new species is that made by R. S. Williams of the same institution in 1908. Most of his specimens were procured in the region of Penonomé and in eastern Panama, and few if any of them, are from the vicinity of the canal.

Powell.—A large portion of our knowledge of the orchids of Panama is the result of the work of C. W. Powell, for over 20 years a resident of the Canal Zone, who by his intensive exploration more than doubled the number of orchids species known previously from the Republic. At Balboa, as a private undertaking, Mr. Powell formed an orchid garden, with about 7,000 plants, representing most of the species known from Panama.[10] Orchids are difficult plants to collect and preserve, and it is only by growing them under natural conditions that they may be studied to best advantage. Mr. Powell collected exhaustively in several parts of Panama, especially in Chiriquí, and it is safe to assert that he discovered practically all the orchids existing about the Canal Zone. His collection was acquired shortly before his death (in 1927) by the Missouri Botanical Garden, and is being maintained as a tropical garden of that institution.

Ostenfeld.—The Danish Oceanographical Expedition with the S. S. *Dana* during the winter of 1921–22 explored the Caribbean Sea and made a cruise to Panama Bay and adjacent parts of the Pacific. While the *Dana* was anchored near Gatún, Dr. C. H. Ostenfeld, of the Copenhagen Botanic Museum, made a small collection of flowering plants in the vicinity. Duplicates of some of these collections are now in the National Herbarium. Dr. Ostenfeld was interested primarily in the study of algae.[11]

Recent collections.—Of more recent collections from the region of the Canal Zone there are in the National Herbarium two made about Panama City by Brothers Gervais and Celestine, of the Christian Brothers College in Panama, amounting to several hundred numbers; a few plants obtained by F. L. Stevens, of the University of Illinois, in connection with his work upon fungi; numerous specimens forwarded by Holger Johansen, of the Plant Introduction Garden at Summit; two collections made upon the Pacific slope by J. Francis Macbride, of the Field Museum of Natural History, while on his way to Peru to engage in botanical exploration; and a few specimens collected by J. N. Rose in 1918.

Ellsworth P. Killip, now in the Division of Plants of the National Museum, lived at Balboa Heights from September, 1917, to May, 1918, and during this period made collections east of Panama City, besides visiting El Boquete and Chiriquí Volcano. In the spring of 1922, while on his return from Colombia to the States, he made another collection of plants in the zone. The specimens of all these collections are in the National Herbarium.

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[10] See Standley, Orchid collecting in Central America, Smiths. Rept. **1924**: 353–377. *pl. 1–26.* 1925.

[11] See C. H. Ostenfeld and G. Nygaard, On the phytoplankton of the Gatun Lake, Panama Canal, Dansk. Bot. Arkiv. **4**^{10}: 1–16. *f. 1–20.* 1925.

In the spring of 1923 Charles Vancouver Piper (1867–1926), of the United States Department of Agriculture, spent about 10 days in the zone. In this brief time he made one of the largest collections of plants ever brought from the region, consisting of over 1,000 numbers, among them some plants not known previously from the Canal Zone. His specimens are all in the National Herbarium.

SMITHSONIAN BIOLOGICAL SURVEY OF THE PANAMA CANAL ZONE.—After the separation of the Republic of Panama as an independent State, in 1903, and the initiation soon afterward by the United States Government of work upon the canal, the interest of scientific workers in the United States was turned toward the Canal Zone, and it is during the past 24 years that most of the scientific work accomplished here has been performed. Transportation between Panama and the United States has been improved, and, what is of far greater importance, sanitary conditions have been so ameliorated that one may live with greater safety in the Canal Zone than in most parts of the United States.

The National Herbarium now has very extensive collections from Panama, and though these represent inadequately the flora of the whole Republic, they certainly include most of the plants growing about the zone. The major portion of these collections has been obtained by special collectors sent out from the Smithsonian Institution, National Museum, and Department of Agriculture.

In 1910 there was organized the Smithsonian Biological Survey of the Panama Canal Zone, which had for its purpose an investigation of the biological features of the canal and its surrounding country. A rather large number of specialists in different branches of the biological sciences visited the canal for long or short periods, and gathered data and extensive collections relating to these subjects.

The botanical exploration of the Canal Zone was assigned to Henry Pittier, then of the Department of Agriculture, who was specially fitted for the task because of his many years of scientific work in Costa Rica, as well as his field work in most other parts of Central America, and in Mexico and Colombia. Mr. Pittier went to the Canal Zone in December, 1910, and remained in Panama for a year. He made large collections about the Zone, and also visited remote parts of Panama which had never been seen by a botanist. In Darién and on the San Blas coast he found scores of new plants, and in Chiriquí also he collected many undescribed species, some of which still await publication. From March, 1914, until early in 1915, Mr. Pittier was again in Panama, as director of the agricultural experiment station at Matías Hernández, now abandoned, and during this time he made further collections. His total collections in Panama amount to about 4,175 numbers, a good proportion of them from central Panama.

William R. Maxon, of the National Museum, spent about three months in Panama, in the spring of 1911, as a member of the Smithsonian expedition, collecting about the zone and in the inexhaustible Chiriquí region. Although his attention was devoted primarily to ferns, he obtained many numbers of flowering plants. In 1923 he spent several weeks about the Canal Zone as a member of a party from the Department of Agriculture under the direction of O. F. Cook, engaged in investigating the rubber resources of Central America, and at that time he collected a still larger series of flowering plants.

A. S. Hitchcock, of the Department of Agriculture, also visited the Canal Zone and Chiriquí in the autumn of 1911. Practically all his time was given to the study of grasses, but a few plants of other groups were procured.

E. A. Goldman, who made a survey of the mammals of Panama and published a report upon them, collected a few plants which are now in the National Herbarium. There are at hand from this period a few other small collections, particularly a series of tree specimens gathered by E. D. Christopherson, and scattered plants communicated to Mr. Pittier by Mrs. D. D. Gaillard and Col. Charles F. Mason.

It was the intention to publish a flora of all Panama, based upon the collections made by the Smithsonian Biological Survey, but various considerations have prevented the execution of the project. Many new species discovered in the course of the exploration have been published in separate papers, mostly in the Contributions from the National Herbarium.

Since work was begun upon the present volume I have visited the Canal Zone twice to study the flora. From November, 1923, until February, 1924, from headquarters at Balboa visits were made to most of the easily accessible localities about the zone. These included all the stations along the railroad, the Atlantic swamps about Fort Randolph and Fort Sherman, the region of Catival, Barro Colorado Island, Taboga Island, and other places of less importance. Numerous excursions were made also to the region east of Panama City, which previously had been neglected. Special attention was given to the collection of vernacular names and data regarding the economic uses of the plants. During this period 7,000 numbers were collected, chiefly phanerogams and ferns.

In November, 1925, on the way to Costa Rica, I visited the zone again, and at this time spent a week on Barro Colorado Island for the purpose of assembling material for a list of plants of the island. About 500 numbers were collected at this time.

Collecting in the region of the canal has now been prosecuted so successfully that the flora is as well known as that of any part of tropical America, and it is likely that few new plants of interest, except some of the large trees, remain to be discovered, at least in those localities thus far accessible. The flora of the Pacific slope is known better than that of the Atlantic watershed, and there probably are few plants awaiting discovery here, unless it be in the savannas toward Chepo, or isolated species confined to some of the swampy forests still unexplored.

The Pacific slope little deserves the excess of attention that has been directed to it. On the other hand, the swamps along the Atlantic coast are not well known, and it may be that they will provide a greater number of additional species than is now anticipated. The headwaters of the Chagres also deserve further exploration. When the proposed road across the Isthmus has been completed this region, at present so difficult of access, may be visited conveniently.

The highways now under construction by the Republic of Panama will greatly facilitate botanical exploration. Within the past year a new road extending southward has opened a region which will well repay the attention of some botanist. Except for the canal region Panama is an almost untouched field for the botanical collector. There is little doubt that exploration of the region toward the Colombian frontier will add some hundreds of additional species to the known flora of North America.

ACKNOWLEDGMENTS

In arranging for the writer's botanical exploration in the Canal Zone, upon which the present publication is based, the United States National Museum received the cooperation of the government of the Canal Zone and of the United States Department of Agriculture. The officials of the Canal Zone, as well as the officers of the Army and Navy in command of the local stations, were generous in furnishing facilities for the prosecution of the necessary field work. The writer wishes also to express his personal appreciation of special assistance rendered during his visits to the Isthmus by Dr. Thomas Barbour, Capt. E. F. Brown, A. A. Hunter, Holger Johansen, C. W. Powell, J. B. Shropshire, and James Zetek. Acknowledgments are due also to Dr. David Fairchild for his initiation of the project which has resulted in the publication of this volume.

The text for several families treated in the flora has been contributed by specialists in the groups concerned: Poaceae by Prof. A. S. Hitchcock and Mrs. Agnes Chase; Orchidaceae by Prof. Oakes Ames, who has provided also the text figures used as illustrations in this family; Piperaceae by Dr. William Trelease; and Passifloraceae by Ellsworth P. Killip.

A large number of the photographs from which the plates are reproduced have been supplied by the Bureau of Plant Industry, United States Department of Agriculture, especially, through the courtesy of O. F. Cook, by the Office of Acclimatization and Adaptation of Crop Plants.

SYSTEMATIC TREATMENT OF THE FLOWERING PLANTS

KEY TO THE FAMILIES[11]

Ovules naked. Palmlike plants. GYMNOSPERMAE. Represented here by a single genus of cultivated plants.............. 1. **CYCADACEAE** (p. 66).
Ovules inclosed in an ovary. ANGIOSPERMAE.
  Stems in cross section showing the vascular strands or fibers irregularly distributed through the pith; embryo with a single cotyledon; parts of the flower usually in 3's or 6's, never in 5's; leaves mostly parallel-veined. **MONOCOTYLEDONEAE.**
  Stems in cross section showing a central pith surrounded by a circle or ring of vascular strands, these often merged into a zone of wood; embryo with 2 cotyledons; parts of the flower usually in 4's or 5's; leaves net-veined.............................. **DICOTYLEDONEAE** (p. 52).

MONOCOTYLEDONEAE

Plants free-floating aquatics, consisting of very small, entire, disklike fronds. 11. **LEMNACEAE** (p. 106).
Plants with stems and leaves, the leaves sometime reduced to scales.
  A. Ovary superior or naked.
    B. Divisions of the perianth sepal-like or none; leaves often pinnately or palmately lobed.
      Leaves plicate in bud, when developed more or less deeply divided. Palms and palmlike plants.
        Perianth segments 6; ovules 1 to 7; inflorescence inclosed in a single spathe; plants trees or shrubs. Palms. 8. **PHOENICACEAE** (p. 93).
        Perianth segments 4, many, or none; ovules many; inflorescence with several spathes; shrubs or herbs. Acaulescent plants. 9. **CYCLANTHACEAE** (p. 100).
      Leaves not plicate, or rarely plicate but entire.
        Flowers, at least the pistillate, arranged on a spadix.
          Leaves with spiny margins; plants treelike, cultivated. 3. **PANDANACEAE** (p. 66).
          Leaves unarmed; plants herbaceous.
            Flower spike usually inclosed in a spathe; leaves not linear. Plants terrestrial or often epiphytic..10. **ARACEAE** (p. 101).
            Flower spike not inclosed in a spathe; leaves linear. Plants growing in wet soil or in water.........2. **TYPHACEAE** (p. 66).

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[11] This key is based chiefly upon a key to the plant families of tropical America published recently by Mr. H. Pittier: Clave analítica de las familias de plantas superiores de la América tropical. Caracas, 1926. In the present key, as well as in the keys to genera on the following pages, only those species occurring in the Canal Zone are taken into consideration.

Flowers not inserted on a spadix.

Ovary 1, 1-celled, 1-ovuled. Grasses or grasslike plants.

Leaves 2-ranked, the sheaths usually split; flowers with a small second bract (palea) next to the rachilla; stems cylindric or flattened, usually hollow..............6. **POACEAE** (p. 67).

Leaves (when present) 3-ranked, the sheaths not split; flowers with no second bract next to the rachilla; stems solid, usually triangular........................7. **CYPERACEAE** (p. 87).

Ovary 2 or 3-celled. Plants acaulescent, with basal leaves, the small flowers in a dense head.......13. **ERIOCAULACEAE** (p. 106).

BB. Divisions of the perianth, at least the inner ones, petal-like; leaves not lobed (sometimes shallowly lobed in Smilacaceae).

Perianth divisions all petaloid.

Endosperm farinose; inflorescence with a basal spathe. Aquatic plants with broad petioled leaves.
16. **PONTEDERIACEAE** (p. 111).

Endosperm fleshy or cartilaginous; inflorescence without a spathe.

Embryo in the margin of the endosperm; leaves equitant.
19. **HAEMODORACEAE** (p. 113).

Embryo surrounded by endosperm; leaves not equitant.

Plants not scandent, unarmed.........17. **LILIACEAE** (p. 112).

Plants scandent, often armed with spines.
18. **SMILACACEAE** (p. 113).

Perianth divisions of 2 kinds, the inner petal-like, the outer sepal-like.

Stamens 1 to 3.

Ovary 1-celled; flowers solitary; plants aquatic, small and slender, with small white flowers.........12. **MAYACACEAE** (p. 106).

Ovary 2 or 3-celled; flowers not solitary; plants not aquatic.
15. **COMMELINACEAE** (p. 109).

Stamens 4 or more.

Ovary 1; plants epiphytic or terrestrial; leaves not petioled.
14. **BROMELIACEAE** (p. 106).

Ovaries 6 or more; plants aquatic; leaves petioled.

Seeds 1 or 2 or few, inserted on a basal placenta; petals white.
4. **ALISMACEAE** (p. 66).

Seeds numerous, inserted on the inner surface of the carpels; petals yellow........................5. **BUTOMACEAE** (p. 67).

AA. Ovary inferior.

Fertile stamens 1, 2, or 5, usually adnate to the style. Flowers irregular.

Androecium composed of one fertile stamen, without staminodia, or with 2 minute staminodes, or of 2 fertile stamens with 1 staminode; seeds without endosperm; plants mostly epiphytic.
28. **ORCHIDACEAE** (p. 122).

Androecium composed of 1 fertile stamen and 1 to 5 staminodes, at least part of these petal-like, or of 5 fertile stamens; endosperm present; plants terrestrial.

Fertile stamens 5......................23. **MUSACEAE** (p. 116).

Fertile stamens 1 to 3.

Fertile stamens 3; ovule 1 in each cell of the ovary.
26. **MARANTACEAE** (p. 119).

Fertile stamen 1; ovules several or many in each cell.

Anthers 2-celled; sepals united; flowers symmetric.
24. **ZINGIBERACEAE** (p. 118).

Anthers 1-celled; sepals distinct; flowers asymmetric.
25. **CANNACEAE** (p. 119).

Fertile stamens 3, 6, or more, free from the style; flowers usually regular.
  Ovary 1-celled.
    Inflorescence subtended by a spathe; perianth segments 4 or many; stigmas 1 or 4; large coarse green plants.
      9. CYCLANTHACEAE (p. 100).
    Inflorescence not subtended by a spathe; perianth segments 6; stigmas 3; small plants without chlorophyll.
      27. BURMANNIACEAE (p. 121).
  Ovary 3-celled.
    Plants scandent, with broad leaves; flowers unisexual.
      21. DIOSCOREACEAE (p. 115).
    Plants not scandent, with narrow leaves; flowers perfect.
      Stamens 3--------------------------**22. IRIDACEAE** (p. 116).
      Stamens 6.
        Perianth divisions unlike, the outer sepal-like.
          23. BROMELIACEAE (p. 106).
        Perianth divisions all petal-like.
          20. AMARYLLIDACEAE (p. 114).

DICOTYLEDONEAE

Perianth segments none, or all alike, especially in color and texture, rarely somewhat unequal but then 5 or fewer-----------**MONOCHLAMYDAE.**
Perianth segments of two kinds, sepals and petals, or those of the two series almost alike but then more than 5.
  Petals distinct, or rarely united above but always distinct at base.
    CHORIPETALAE (p. 55).
  Petals united, at least at base--------------------**SYMPETALAE** (p. 62).

MONOCHLAMYDAE

A. Ovary wholly or partly inferior.
  Ovary completely 2 to many-celled.
    Leaves with stipules; flowers monoecious; succulent herbs or rarely shrubs-----------------------------**104. BEGONIACEAE** (p. 277).
    Leaves without stipules; flowers perfect; plants not succulent, usually scandent, rarely erect shrubs---**39. ARISTOLOCHIACEAE** (p. 169).
  Ovary 1-celled, or sometimes incompletely many-celled.
    Ovules 2 or more.
      Ovules 2 to 4.
        Ovules 2, basal-------------------**61. AMYGDALACEAE** (p. 188).
        Ovules 2 to 4, apical-------------**110. COMBRETACEAE** (p. 284).
      Ovules 6 or more. Flowers very irregular.
        39. ARISTOLOCHIACEAE (p. 169).
    Ovule 1.
      Stamens as many as the perianth divisions and alternate with them. Flowers in a dense head surrounded by an involucre of bracts; stamens 5, the anthers coherent-------**142. ASTERACEAE** (p. 371).
      Stamens as many as the perianth divisions and opposite them, or fewer or more numerous.
        Leaves with stipules; trees or shrubs, not parasitic.
          34. MORACEAE (p. 157).
        Leaves without stipules; parasitic shrubs.
          37. LORANTHACEAE (p. 166).

AA. Ovary superior, nearly superior, or naked.
  B. Perfect or pistillate flowers without a perianth.
    Ovary with 2 or more cells.
      Ovary 1, 3-celled; fruit a capsule.....77. **EUPHORBIACEAE** (p. 230).
      Ovary of 3 free carpels; fruit a drupe.49. **MENISPERMACEAE** (p. 178).
    Ovary 1-celled.
      Ovules numerous.
        Plants trees; flowers dioecious..........32. **SALICACEAE** (p. 157).
        Plants small mosslike herbs, growing on stones in water; flowers perfect. 57. **PODOSTEMONACEAE** (p. 186).
      Ovule 1.
        Staminate flowers without a perianth. Shrubs or herbs with entire leaves; flowers in dense spikes.......30. **PIPERACEAE** (p. 153).
        Staminate flowers with a perianth. Flowers always unisexual.
          Leaves reduced to small scales; fruit conelike. Cultivated trees. 29. **CASUARINACEAE** (p. 152).
          Leaves not reduced to scales; fruit not conelike.
            Leaves with stipules.
              Stamens erect in bud. Trees with milky sap, or rarely acaulescent herbs; leaves alternate; plants never with stinging hairs. 34. **MORACEAE** (p. 157).
              Stamens inflexed in bud; herbs, shrubs, or trees, the sap not milky; leaves alternate or opposite; plants often with stinging hairs..................35. **URTICACEAE** (p. 164).
            Leaves without stipules.
              Flowers in dense heads surrounded by an involucre of bracts. 142. **ASTERACEAE** (p. 371).
              Flowers not in heads. Ill-scented herbs. 41. **CHENOPODIACEAE** (p. 171).
  BB. Perfect or pistillate flowers with a perianth.
    C. Ovary 1 and 1-celled.
      D. Ovule 1.
        Leaves with stipules.
          Styles 3, distinct or united at base, with terminal, globose or penicillate stigmas, or the stigmas sessile. Stipules usually united to form a tubular sheath............40. **POLYGONACEAE** (p. 169).
          Style 1, or bipartite, or stigmas 1 or 2 and sessile.
            Flowers perfect, racemose. Stigma 1; leaves broad, alternate; plants usually herbaceous.44. **PHYTOLACCACEAE** (p. 176).
            Flowers unisexual, or sometimes polygamous but the plants then shrubs or trees.
              Stamens more numerous than the perianth divisions. Trees or shrubs with alternate leaves. 77. **EUPHORBIACEAE** (p. 230).
              Stamens as many as the perianth divisions or fewer. Fruit indehiscent.
                Flowers solitary or glomerate; stamens straight in bud; trees, the sap not milky...........33. **ULMACEAE** (p. 157).
                Flowers in spikes, racemes, or heads, or inserted on the interior surface of a hollow receptacle, rarely glomerate, but the stamens then inflexed in bud.34. **MORACEAE** (p. 157).

Leaves without stipules.

Perianth imbricate in bud.

Perianth 6-parted. Shrubs or trees..53. **LAURACEAE** (p. 182).

Perianth with 2 to 5 divisions.

Flowers not bracted; plants ill-scented. 41. **CHENOPODIACEAE** (p. 171).

Flowers subtended by bracts and bractlets; plants not ill-scented. 42. **AMARANTHACEAE** (p. 172).

Perianth valvate or open in bud.

Stamens inserted upon the 4-parted perianth. Small trees with simple or pinnate, alternate leaves. 36. **PROTEACEAE** (p. 166).

Stamens free from the perianth, or if united with it, the plants herbaceous or with opposite leaves.

Filaments completely united; large trees. 51. **MYRISTICACEAE** (p. 182).

Filaments free or united only at base.

Stamens 3 or 4, as many as the perianth divisions. 35. **URTICACEAE** (p. 164).

Stamens fewer or more numerous than the perianth divisions. 43. **NYCTAGINACEAE** (p. 174).

DD. Ovules 2 or more.

Ovules 2.

Flowers unisexual; styles 3, or stigma 1 and sessile. 77. **EUPHORBIACEAE** (p. 230).

Flowers perfect or polygamous; style 1, entire.

Stamens 4. Small trees with simple or pinnate leaves, the leaves or leaflets toothed............36. **PROTEACEAE** (p. 166).

Stamens 8 to 10. Large trees, the leaves with 4 entire leaflets. (*Prioria*)................64. **CAESALPINIACEAE** (p. 197).

Ovules 3 or more.

Leaves compound. (*Swartzia*) .64. **CAESALPINIACEAE** (p. 197).

Leaves simple.

Stamen 1. Shrubs or trees; leaves alternate, entire, without stipules..................31. **LACISTEMACEAE** (p. 156).

Stamens 5 or more. Shrubs or trees.

Stamens 5......................38. **OLACACEAE** (p. 168).

Stamens 6 or more.........99. **FLACOURTIACEAE** (p. 272).

CC. Ovary with 2 or more cells.

Ovaries several, distinct.

Filaments united; leaves alternate...89. **STERCULIACEAE** (p. 261).

Filaments not united; leaves opposite..52. **MONIMIACEAE** (p. 182).

Ovary 1.

Ovule 1 in each cell of the ovary.

Flowers perfect...............44. **PHYTOLACCACEAE** (p. 176).

Flowers polygamous or unisexual.

Flowers polygamous..............83. **RHAMNACEAE** (p. 247).

Flowers unisexual.

Ovary 3-celled; ovules pendent. 77. **EUPHORBIACEAE** (p. 230).

Ovary with more than 3 cells; ovules ascending. 44. **PHYTOLACCACEAE** (p. 176).

Ovules 2 or more in each cell.
Ovules 2 in each cell. Flowers polygamous or unisexual.
Styles several.................77. **EUPHORBIACEAE** (p. 230).
Style 1, with 5 stigmas. Fruit spiny. (*Triumfetta.*) 86. **TILIACEAE** (p. 250).
Ovules more than 2 in each cell.
Plants aquatic, mosslike....57. **PODOSTEMONACEAE** (p. 186).
Plants terrestrial.
Stamens perigynous. Leaves opposite or verticillate, without stipules; small glabrous herbs. (*Rotala.*) 106. **LYTHRACEAE** (p. 280).
Stamens hypogynous.
Stamens 6 or fewer. Small herbs..45. **AIZOACEAE** (p. 177).
Stamens 10 or more.
Stamens 15 or fewer, united to form a column. Shrubs. (*Triumfetta.*)..............86. **TILIACEAE** (p. 250).
Stamens many, inserted on the receptacle.
Ovary 3 or 5-celled, the placentae axial. (*Prockia.*) 99. **FLACOURTIACEAE** (p. 272).
Ovary 4 or 6-celled, the placentae parietal. 85. **ELAEOCARPACEAE** (p. 249).

CHORIPETALAE

A. Ovary superior or nearly so.
B. Ovary 1, 1-celled or incompletely several-celled.
Sepals 2. Small fleshy herbs...........46. **PORTULACACEAE** (p. 177).
Sepals 3 or more.
C. Perfect stamens 10 or fewer.
Styles 2 or more, free or partly united, with distinct stigmas, or the stigmas 2 or more and sessile.
Leaves compound. Trees..........56. **MORINGACEAE** (p. 186).
Leaves simple.
Plants woody.........................98. **VIOLACEAE** (p. 271).
Plants herbaceous.....................47. **SILENACEAE** (p. 178).
Style 1, simple, with 1 stigma or several united stigmas, or the stigma 1 and sessile.
E. Ovules 1 or 2.
Leaves with stipules.
Style basal. Leaves simple...61. **AMYGDALACEAE** (p. 188).
Style terminal; leaves usually compound.
Flowers papilionaceous............65. **FABACEAE** (p. 203).
Flowers nearly regular...64. **CAESALPINIACEAE** (p. 197).
Leaves without stipules.
Leaves simple. Trees or shrubs.
Stamens hypogynous; endosperm scant or none. 78. **ANACARDIACEAE** (p. 240).
Stamens inserted on the corolla tube; endosperm copious. 38. **OLACACEAE** (p. 168).
Leaves compound.
Flowers irregular.
Stamens 4 to 8; anthers dehiscent by apical pores. 76. **POLYGALACEAE** (p. 229).
Stamens 9 or 10; anthers dehiscent by longitudinal slits. 65. **FABACEAE** (p. 203).

Flowers regular.

Sepals and petals each 3; anthers dehiscent by valves. Trees........ 53. **LAURACEAE** (p. 182).

Sepals and petals each 4 to 6; anthers dehiscent by longitudinal slits

Plants scandent, dioecious. 49. **MENISPERMACEAE** (p. 178).

Plants erect shrubs or trees, the flowers perfect or polygamous.

Petals valvate in bud; ovules usually 2. 38. **OLACACEAE** (p. 168).

Petals imbricate; ovule 1. 78. **ANACARDIACEAE** (p. 240).

EE. Ovules more than 2.

Placenta attached to the ventral suture of the ovary.

Corolla not papilionaceous. 64. **CAESALPINIACEAE** (p. 197).

Corolla papilionaceous........ 65. **FABACEAE** (p. 203).

Placentae 2 or more and parietal.

Petals 4........ 55. **CAPPARIDACEAE** (p. 185).

Petals 5.

Leaves compound........ 56. **MORINGACEAE** (p. 186).

Leaves simple........ 98. **VIOLACEAE** (p. 271).

CC. Perfect stamens more than 10.

Plants scandent; receptacle expanded into a discoid or fimbriate corona........ 101. **PASSIFLORACEAE** (p. 275).

Plants erect, or rarely scandent but the disk without a corona.

Styles or stigmas 2 or more.

Leaves opposite. Shrubs or trees with milky sap. 95. **CLUSIACEAE** (p. 268).

Leaves alternate.

Styles 3........ 100. **TURNERACEAE** (p. 274).

Styles 5 or 6........ 99. **FLACOURTIACEAE** (p. 272).

Style or sessile stigma 1, the style simple.

Ovule 1, basal. Trees; leaves opposite, without stipules. 95. **CLUSIACEAE** (p. 268).

Ovules 2 or more.

Ovules inserted basally, apically, centrally, or on the sutures.

Petals and stamens perigynous.

Leaves simple, entire........ 106. **LYTHRACEAE** (p. 280).

Leaves compound........ 64. **CAESALPINIACEAE** (p. 197).

Petals and stamens hypogynous.

Sepals imbricate in bud. Shrubs or small trees, often scandent, the leaves usually very rough. 90. **DILLENIACEAE** (p. 264).

Sepals valvate.

Leaves compound........ 64. **CAESALPINIACEAE** (p. 197).

Leaves simple........ 109. **RHIZOPHORACEAE** (p. 283).

Ovules inserted on parietal placentae.

Style usually none, or evident but the plants then herbaceous. Petals 4........ 55. **CAPPARIDACEAE** (p. 185).

Style evident. Trees or shrubs.

Petals sepal-like, perigynous. 99. **FLACOURTIACEAE** (p. 272).

Petals distinct from the sepals, hypogynous.

Ovary 1-celled; capsule usually spiny; seeds glabrous; flowers white or pink----96. **BIXACEAE** (p. 270).

Ovary incompletely 2 to 5-celled; capsule unarmed; seeds woolly; flowers yellow. 97. **COCHLOSPERMACEAE** (p. 270).

BB. Ovary 1, with 2 or more complete or nearly complete cells, or the ovaries several and distinct.

F. Ovaries 2 or more, distinct or united only at base, the styles and stigmas distinct.

Petals and stamens perigynous. Leaves pinnate, with stipules. 60. **ROSACEAE** (p. 187).

Petals and stamens hypogynous.

Stamens as many or twice as many as the sepals.

Ovule 1 in each carpel. Plants scandent; petals usually 6; leaves alternate----------------49. **MENISPERMACEAE** (p. 178).

Ovules 2 or more in each carpel.

Plants herbaceous; leaves fleshy, compound. 58. **CRASSULACEAE** (p. 187).

Plants trees or shrubs; leaves not fleshy.

Plants scandent; stamens 10--62. **CONNARACEAE** (p. 189).

Plants not scandent; stamens 3 to 8--69. **RUTACEAE** (p. 222).

Stamens more than twice as many as the sepals.

Perianth of 3 sepals and 6 (rarely 3) petals. Shrubs or trees with entire leaves, without stipules---50. **ANNONACEAE** (p. 179).

Perianth usually of 4 or more sepals and the same number (or fewer) of petals. Shrubs or trees, often scandent; leaves simple, usually very rough---------------90. **DILLENIACEAE** (p. 264).

FF. Ovaries 2 or more with united styles and stigmas, or the ovary 1.

G. Ovule 1 (very rarely 2) in each cell of the ovary or in each carpel.

Stamens perigynous.

Stamens 10 or more. Trees or shrubs; style basal. 61. **AMYGDALACEAE** (p. 188).

Stamens 4 or 5. Trees or shrubs.

Calyx valvate in bud; stamens opposite the petals. 83. **RHAMNACEAE** (p. 247).

Calyx imbricate; stamens alternate with the petals or opposite them. 79. **CELASTRACEAE** (p. 242).

Stamens hypogynous.

Flowers unisexual.

Ovary 4 to 6-parted. Shrubs or trees; leaves alternate, pinnate, without stipules----------70. **SIMAROUBACEAE** (p. 223).

Ovary entire or shallowly lobed. Leaves entire or palmately lobed.

Cells of the ovary 4 or 5; fruit drupaceous. Leaves opposite. 95. **CLUSIACEAE** (p. 268).

Cells of the ovary 3; fruit capsular. 77. **EUPHORBIACEAE** (p. 230).

Flowers perfect or polygamous.

Flowers polygamous.

Leaves opposite, entire----------95. **CLUSIACEAE** (p. 268).

Leaves alternate, often compound.

Stamens inserted within the disk-82. **SAPINDACEAE** (p. 243).

Stamens inserted outside the disk. 78. **ANACARDIACEAE** (p. 240).

Flowers perfect.
  Stamens more than 10.
    Sepals valvate or open in bud; anthers 1-celled.
      87. MALVACEAE (p. 252).
    Sepals imbricate; anthers 2-celled.
      Disk none. Shrubs or small trees with entire stipulate leaves.
        67. ERYTHROXYLACEAE (p. 221).
      Disk present. Shrubs or small trees; leaves usually toothed, with stipules; flowers yellow.
        91. OCHNACEAE (p. 266).
  Stamens 10 or fewer.
    Plants herbaceous, the leaves lobed or coarsely toothed. Petals 4; fruit dry; stamens 6---**54. BRASSICACEAE** (p. 184).
    Plants woody, or if herbaceous the leaves entire.
      Leaves simple.
        Stamens 8; herbs or scandent shrubs; calyx without glands. Flowers irregular.
          76. POLYGALACEAE (p. 229).
        Stamens usually 10, some of them often sterile; shrubs or trees, often scandent; calyx usually with large glands outside. Flowers yellow or pink.
          73. MALPIGHIACEAE (p. 226).
      Leaves compound.
        Filaments united. Ovary entire.
          72. MELIACEAE (p. 225).
        Filaments free.
          Leaves with translucent glands; filaments not appendaged; ovary entire-**69. RUTACEAE** (p. 222).
          Leaves opaque; filaments usually with a basal scale; ovary almost always divided.
            70. SIMAROUBACEAE (p. 223).

GG. Ovules 2 or more in each cell of the ovary.
  H. Stamens hypogynous or more or less perigynous; disk none, but separate glands or a gynophore sometimes present.
    Leaves opposite or verticillate.
      Stamens more than 10. Shrubs or trees; leaves entire.
        94. HYPERICACEAE (p. 267).
      Stamens 10 or fewer.
        Flowers unisexual; sap milky-----**95. CLUSIACEAE** (p. 268).
        Flowers perfect; sap not milky.
          Fertile stamens 7 to 12; petals more than 5.
            106. LYTHRACEAE (p. 280).
          Fertile stamens 6 or fewer; petals 3 or 5.
            Fertile stamens 6; scandent shrubs; petals 5, white, none of them spurred-----**74. TRIGONIACEAE** (p. 229).
            Fertile stamen 1; large trees; petals 3, yellow, one of them spurred-------------**75. VOCHYSIACEAE** (p. 229).
    Leaves alternate.
      Leaves with stipules.
        Calyx segments imbricate in bud.
          Stamens more than 10. Petals 4.
            55. CAPPARIDACEAE (p. 185).
          Stamens 10----------**67. ERYTHROXYLACEAE** (p. 221).

Calyx segments valvate or open in bud.

Ovary stipitate. Petals 4..55. **CAPPARIDACEAE** (p. 185).

Ovary sessile or nearly so.

Anthers 1-celled, dehiscent by one pore or slit.

Leaves simple; filaments adnate nearly to the apex; herbs or shrubs......87. **MALVACEAE** (p. 252).

Leaves usually compound, sometimes simple; filaments adnate only below the middle; trees. 88. **BOMBACACEAE** (p. 258).

Anthers 2-celled, dehiscent by 2 pores or slits.

Filaments adnate; staminodia present. 89. **STERCULIACEAE** (p. 261).

Filaments free or adnate only at base, in the latter case staminodia not present..86. **TILIACEAE** (p. 250).

Leaves without stipules.

Stamens twice as many as the petals or fewer.

Leaves with translucent glands...69. **RUTACEAE** (p. 222).

Leaves opaque.

Leaves compound.

Plants herbaceous; leaflets 3. 66. **OXALIDACEAE** (p. 221).

Plants trees or shrubs; leaflets usually more than 3. 72. **MELIACEAE** (p. 225).

Leaves simple.

Plants epiphytic shrubs. Leaves entire; stamens 3. 92. **MARCGRAVIACEAE** (p. 266).

Plants terrestrial.

Petals 4. Plants herbaceous. 54. **BRASSICACEAE** (p. 184).

Petals 5.

Sepals valvate in bud. Herbs, shrubs, or trees; leaves usually toothed or lobed. 89. **STERCULIACEAE** (p. 261).

Sepals imbricate. Shrubs; leaves entire. 67. **ERYTHROXYLACEAE** (p. 221).

Stamens more than twice as many as the petals.

Ovary long-stipitate. Petals 4. 55. **CAPPARIDACEAE** (p. 185).

Ovary sessile; petals 5...........93. **THEACEAE** (p. 267).

HH. Stamens hypogynous, but inserted on the base or on the surface of a disk, or sometimes somehwat perigynous, being inserted upon a concave disklike receptacle.

I. Leaves with stipules.

Stamens as many as the petals or fewer.

Stamens as many as the petals and opposite them. Vines; leaves alternate, often compound.84. **VITACEAE** (p. 248).

Stamens as many as the petals and alternate with them, or more numerous.

Leaves compound.

Disk extrastaminal..........82. **SAPINDACEAE** (p. 243).

Disk intrastaminal.

Ovary 3-celled; leaves pinnate, opaque. 81. **STAPHYLEACEAE** (p. 243).

Ovary 5-celled; leaves with translucent glands.
69. **RUTACEAE** (p. 222).
Leaves simple.
Style 1, simple; flowers perfect.
79. **CELASTRACEAE** (p. 242).
Style 1 and parted, or styles 3; flowers unisexual.
77. **EUPHORBIACEAE** (p. 230).
Stamens twice as many as the petals or more.
Styles 3..................77. **EUPHORBIACEAE** (p. 230).
Style 1.
Leaves compound. Trees.68. **ZYGOPHYLLACEAE** (p. 221).
Leaves simple.
Plants aquatic herbs...48. **NYMPHAEACEAE** (p. 178).
Plants trees or shrubs..85. **ELAEOCARPACEAE** (p. 249).
II. Leaves without stipules.
Leaves simple; disk present or absent.
Leaves alternate, with translucent glands.
69. **RUTACEAE** (p. 222).
Leaves opposite or verticillate.
Stamens 3, fewer than the petals. Woody plants, usually scandent.........80. **HIPPOCRATEACEAE** (p. 243).
Stamens as many as the petals or more numerous.
Ovules 2 in each cell of the ovary.
Leaves dotted with transparent glands.
69. **RUTACEAE** (p. 222).
Leaves without glands....82. **SAPINDACEAE** (p. 243).
Ovules more than 2 in each cell.
Styles or sessile stigmas 5 to 10. Trees or shrubs with entire leaves..........95. **CLUSIACEAE** (p. 268).
Style 1, simple.
Calyx lobes imbricate or open in bud, sometimes united as a cap; anthers dehiscent by apical pores or by one slit; leaves usually with longtitudinal nerves.......112. **MELASTOMACEAE** (p. 288).
Calyx valvate; anthers dehiscent by 2 longitudinal slits..............106. **LYTHRACEAE** (p. 280).
Leaves compound; disk always present.
Stamens inserted within the disk..82. **SAPINDACEAE** (p. 243).
Stamens inserted outside the disk.
Stamens as many as the petals and opposite them; flowers dioecious...........70. **SIMAROUBACEAE** (p. 223).
Stamens as many as the petals and alternate with them, or more or less numerous; flowers perfect.
Stamens united..............72. **MELIACEAE** (p. 225).
Stamens free.
Leaves with translucent glands.69. **RUTACEAE** (p. 222).
Leaves without glands...71. **BURSERACEAE** (p. 224).
AA. Ovary inferior or semi-inferior.
J. Perfect stamens 10 or fewer.
Ovule 1 in each cell of the ovary, or the ovary 1-celled and 1-ovulate.
Stamens as many as the petals and opposite them.
Ovary 1-celled; plants parasitic.....37. **LORANTHACEAE** (p. 166).
Ovary 2 to 4-celled; plants terrestrial..83. **RHAMNACEAE** (p. 247).

Stamens as many as the petals and alternate with them, or fewer or more numerous.

Fruit a berry or a drupe; shrubs or trees 114. **ARALIACEAE** (p. 295).

Fruit of dry carpels, these separating at maturity; herbs. 115. **APIACEAE** (p. 296).

Ovules 2 or more in each cell of the ovary or in the 1-celled ovary.

Style 1, simple or divided only at apex, or stigma 1 and sessile.

Petals valvate in bud. Shrubs or trees. 110. **COMBRETACEAE** (p. 284).

Petals imbricate.

Anthers dehiscent by apical pores; leaves with longitudinal nerves. 112. **MELASTOMACEAE** (p. 288).

Anthers dehiscent by slits; leaves pinnate-nerved. 113. **ONAGRACEAE** (p. 294).

Styles 2 or more, free or united only at base, or the stigmas 2 or more and sessile.

Plants woody, scandent 59. **HYDRANGEACEAE** (p. 187).

Plants herbaceous.

Flowers perfect; stamens often numerous. Succulent herbs, without tendrils 46. **PORTULACACEAE** (p. 177).

Flowers dioecious; stamens 2 to 5; herbs with tendrils. 140. **CUCURBITACEAE** (p. 365).

JJ. Perfect stamens more than 10.

Style 1, simple or rarely parted at the apex, or stigma 1 and sessile.

Leaves with stipules. Shrubs or trees.

Calyx imbricate in bud. Ovary 1-celled, with many ovules; leaves alternate 99. **FLACOURTIACEAE** (p. 272).

Calyx valvate or open in bud.

Leaves alternate; ovary 1-celled, 1-ovulate. 61. **AMYGDALACEAE** (p. 188).

Leaves opposite; ovary many-celled, with 2 ovules in each cell. 109. **RHIZOPHORACEAE** (p. 283).

Leaves without stipules.

Petals conduplicate-valvate in bud. Herbs 103. **LOASACEAE** (p. 276).

Petals imbricate in bud.

Ovary 1-celled, with many ovules. Plants succulent, often armed with spines; leaves usually much reduced or absent. 105. **CACTACEAE** (p. 277).

Ovary 1-celled and with only 2 to 10 ovules, or usually several-celled. Plants unarmed, with broad thin leaves.

Leaves alternate, without translucent glands; stamens numerous. Trees or shrubs 108. **LECYTHIDACEAE** (p. 282).

Leaves alternate, opposite, or verticillate; stamens twice as many as the petals, or more numerous but the leaves then with translucent glands.

Stamens usually as many or twice as many as the petals; leaves usually with longitudinal nerves, without translucent glands 112. **MELASTOMACEAE** (p. 288).

Stamens numerous; leaves pinnate-nerved, often with translucent glands.

Sepals 2 to 4, or more but imbricate in bud; leaves nearly always with translucent glands. 111. **MYRTACEAE** (p. 286).

Sepals 5 to 8, valvate in bud; leaves without glands. 107. **PUNICACEAE** (p. 282).

Styles 2 or more, free or united at base, or stigmas 2 or more and sessile.
  Leaves with stipules.
    Flowers monoecious, irregular; herbs--104. **BEGONIACEAE** (p. 277).
    Flowers perfect, regular; shrubs or trees.
      99. **FLACOURTIACEAE** (p. 272).
  Leaves without stipules. Herbs.
    Ovary 1-celled; leaves alternate---------103. **LOASACEAE** (p. 276).
    Ovary 5 to 7-celled; leaves opposite or verticillate.
      45. **AIZOACEAE** (p. 177).

SYMPETALAE

A. Ovary superior or nearly superior.
  B. Perfect stamens as many as the corolla lobes and opposite them, or more numerous.
    Ovary 1-celled.
      Ovules inserted on the ventral suture of the ovary. Leaves usually compound, with stipules-----------------63. **MIMOSACEAE** (p. 189).
      Ovules inserted on parietal or axial placentae. Leaves without stipules.
        Leaves lobed. Plants treelike, with milky sap.
          102. **CARICACEAE** (p. 276).
        Leaves entire.
          Plants trees or shrubs; fruit a drupe.
            116. **MYRSINACEAE** (p. 297).
          Plants small herbs; fruit a capsule--117. **PRIMULACEAE** (p. 298).
    Ovary perfectly or sometimes imperfectly divided into 2 or more cells.
      Leaves with stipules (stipules sometimes minute or caducous).
        Flowers unisexual-----------------77. **EUPHORBIACEAE** (p. 230).
        Flowers perfect.
          Anthers 2-celled.
            Stamens united-----------------89. **STERCULIACEAE** (p. 261).
            Stamens free--------------------120. **LOGANIACEAE** (p. 302).
          Anthers 1-celled.
            Leaves simple; filaments united nearly to the apex.
              87. **MALVACEAE** (p. 252).
            Leaves usually compound; filaments united only below the middle.
              88. **BOMBACACEAE** (p. 258).
      Leaves without stipules.
        Flowers unisexual.
          Stamens 5 or 10; leaves lobed-------102. **CARICACEAE** (p. 276).
          Stamens more than 10; leaves entire-----93. **THEACEAE** (p. 267).
        Flowers perfect.
          Stamens as many or twice as many as the corolla lobes. Trees with milky sap---------------------118. **SAPOTACEAE** (p. 299).
          Stamens more than twice as many as the corolla lobes. Shrubs or trees.
            Flowers irregular; fruit capsular; plants epiphytic.
              92. **MARCGRAVIACEAE** (p. 266).
            Flowers regular; fruit a berry; plants terrestrial.
              93. **THEACEAE** (p. 267).
  BB. Perfect stamens as many as the corolla lobes and alternate with them, or fewer.
    C. Perfect stamens 3 or more, as many as the corolla lobes; flowers usually regular.

D. Ovary simple and 1 or 2-celled, or ovaries 2 and distinct.

Leaves opposite.

Ovules 2 or 4 in each ovary.

Style stigmatose only below the apex. Shrubs or trees with milky sap, often scandent.........123. **APOCYNACEAE** (p. 305).

Style stigmatose at the apex or between its lobes.

Corolla lobes valvate in bud...120. **LOGANIACEAE** (p. 302).

Corolla lobes imbricate........129. **VERBENACEAE** (p. 320).

Ovules more than 4 in each ovary.

Corolla valvate or plicate in bud.

Ovules erect; stigmas usually 2; leaves simple. Plants usually herbaceous and scandent. 125. **CONVOLVULACEAE** (p. 312).

Ovules pendent; stigma 1; leaves compound. Plants usually woody and not scandent.....63. **MIMOSACEAE** (p. 189).

Corolla imbricate in bud.

Style stigmatose below the apex; stigma 1; plants with milky sap, often scandent.....123. **APOCYNACEAE** (p. 305).

Style stigmatose at the apex or apices or between the lobes; stigmas usually 2; sap not milky. 128. **BORAGINACEAE** (p. 317).

Leaves alternate.

Leaves compound.................63. **MIMOSACEAE** (p. 189).

Leaves simple.

Style stigmatose only below the apex; ovaries usually 2. Plants with milky sap and entire leaves.

Styles parted to the apex; stigma with 5 glands alternating with the anthers....124. **ASCLEPIADACEAE** (p. 310).

Styles separated only at base, or completely united; stigma without glands..........123. **APOCYNACEAE** (p. 305).

Style stigmatose at the apex or between its lobes; ovary entire or slightly lobed.

Style bifid or bipartite, with terminal stigmas. Herbs. 127. **HYDROPHYLLACEAE** (p. 317).

Style simple, the stigma entire or bipartite.

Ovary 1-celled. Herbs with entire leaves. 121. **GENTIANACEAE** (p. 303).

Ovary 2-celled.

Corolla valvate or plicate in bud, rarely imbricate and not plicate, in this case the fruit baccate or transversely dehiscent.............131. **SOLANACEAE** (p. 327).

Corolla imbricate and not plicate in bud; fruit dry, longitudinally dehiscent. 132. **SCROPHULARIACEAE** (p. 333).

DD. Ovary 1 and of 3 or more cells, or ovaries 3 or more and distinct.

Ovules 1 or 2 in each cell of the ovary.

Leaves opposite. Ovary 4-lobed.

Stamens 4 or 2; stigmas 2 or rarely 1; corolla irregular. 130. **MENTHACEAE** (p. 324).

Stamens 5; stigma 1; corolla regular. 128. **BORAGINACEAE** (p. 317).

Leaves alternate.

Radicle superior; flowers in one-sided cymes. 128. **BORAGINACEAE** (p. 317).

Radicle inferior; flowers never in one-sided cymes. 125. **CONVOLVULACEAE** (p. 312).

Ovules 2 or more in each cell.

Corolla valvate or plicate in bud...131. **SOLANACEAE** (p. 327).

Corolla contorted in bud. Herbs. 126. **POLEMONIACEAE** (p. 317).

CC. Perfect stamens 2 to 4, fewer than the corolla lobes, rarely as many (2) as the lobes; flowers usually irregular.

Ovules in the ovary 1 to 10, in each cell 1 or 2 or rarely 3 or 4.

Ovule 1 in each cell.

Ovary entire.....................129. **VERBENACEAE** (p. 320).

Ovary 4-parted...................130. **MENTHACEAE** (p. 324).

Ovules 2 to 4 in each cell.

Stamens 2, regularly alternate with the cells of the ovary. Leaves opposite.......................119. **OLEACEAE** (p. 301).

Stamens 4 or 2, if 2 not regularly alternate with the ovary cells.

Ovules 2 in each cell and collateral; fruit indehiscent or septicidally dehiscent..................129. **VERBENACEAE** (p. 320).

Ovules 2 and superimposed, or 4; fruit loculicidally dehiscent or rarely indehiscent.

Seeds with endosperm, sessile or nearly so; stigma 1. 132. **SCROPHULARIACEAE** (p. 333).

Seeds without endosperm, the funicles in age hard and hooklike; stigmas usually 2.........137. **ACANTHACEAE** (p. 346).

Ovules numerous, more than 4 in each cell.

Ovary 1-celled.

Placenta central, free; plants aquatic. 136. **PINGUICULACEAE** (p. 346).

Placentae parietal; plants not aquatic.

Plants trees; fruit baccate; leaves usually compound. 133. **BIGNONIACEAE** (p. 337).

Plants herbs or small shrubs; fruit capsular; leaves simple. 135. **GESNERIACEAE** (p. 344).

Ovary completely 2 or 4-celled.

Ovary 4-celled. Stamens 4.

Plants woody; leaves usually compound. 133. **BIGNONIACEAE** (p. 337).

Plants herbaceous; leaves simple...134. **PEDALIACEAE** (p. 344).

Ovary 3-celled.

Leaves alternate and simple.

Corolla induplicate-valvate in bud, or plicate and imbricate. 131. **SOLANACEAE** (p. 327).

Corolla imbricate but not plicate in bud. 132. **SCROPHULARIACEAE** (p. 333).

Leaves alternate and compound, or more commonly opposite or verticillate.

Leaves compound, rarely simple but the plants then trees. Trees or shrubs, often scandent. 133. **BIGNONIACEAE** (p. 337).

Leaves simple. Plants usually herbs, rarely shrubs or small trees, very rarely scandent.
  Seeds inserted on enlarged hooklike funicles. 137. **ACANTHACEAE** (p. 346).
  Seeds sessile, or the funicles very short and not hooked. 132. **SCROPHULARIACEAE** (p. 333).

AA. Ovary inferior or semi-inferior.
 Stamens numerous; plants succulent, usually armed with spines; leaves usually much reduced or absent 105. **CACTACEAE** (p. 277).
 Stamens 10 or fewer; plants not succulent, usually unarmed; leaves well developed.
  Ovary containing a single ovule.
   Corolla lobes valvate or open in bud.
    Anthers free; corolla present in all the flowers; fruit not an achene. Leaves opposite or verticillate 138. **RUBIACEAE** (p. 351).
    Anthers united, rarely free, but the fertile flowers then without a corolla; fruit an achene. Leaves opposite or alternate. 142. **ASTERACEAE** (p. 371).
   Corolla lobes imbricate in bud. Plants herbaceous; leaves alternate. 140. **CUCURBITACEAE** (p. 365).
  Ovary containing 2 or more ovules.
   Perfect stamens fewer than the corolla lobes.
    Flowers unisexual, regular; plants scandent or creeping, usually with tendrils; stamens 3 140. **CUCURBITACEAE** (p. 365).
    Flowers perfect, irregular; plants usually erect, without tendrils; stamens 4 135. **GESNERIACEAE** (p. 344).
   Perfect stamens as many as the corolla lobes.
    Ovaries 2, distinct. Plants with milky sap. 123. **APOCYNACEAE** (p. 305).
    Ovary, 1 entire.
     Leaves alternate.
      Petals united to form a cap; style divided. Shrubs or trees, the leaves usually compound; flowers in umbels or heads. 114. **ARALIACEAE** (p. 295).
      Petals free at apex; style usually entire.
       Flowers unisexual, regular; plants scandent or prostrate, usually with tendrils, the sap not milky. 140. **CUCURBITACEAE** (p. 365).
       Flowers perfect; plants herbaceous, without tendrils, with milky sap 141. **LOBELIACEAE** (p. 370).
     Leaves opposite or verticillate.
      Leaves simple, with stipules 138. **RUBIACEAE** (p. 351).
      Leaves pinnate, without stipules. 139. **CAPRIFOLIACEAE** (p. 365).

ANNOTATED CATALOGUE

1. CYCADACEAE. Cycad Family

The genus *Zamia* is represented in Panama by native species.

1. CYCAS L.

Pinnae about 12 mm. wide, with flat margins..............1. **C. circinalis** L.
Pinnae less than 5 mm. wide, with incurved margins....2. **C. revoluta** Thunb.

These are palmlike plants with a thick cylindric trunk surmounted by a cluster of large leaves. The leaves are once pinnate and have very numerous, closely set, rigid, linear pinnae. The fruits are large and conelike. *C. revoluta* is planted in various locations about Ancón and Balboa, and *C. circinalis* at Ancón. Both species are of East Indian origin.

2. TYPHACEAE. Cattail Family

1. TYPHA L. Cattail

The common cattail of tropical America, *T. angustifolia* L., is frequent in shallow water. In Mexico and Salvador it is known as "tule."

3. PANDANACEAE. Screwpine Family

1. PANDANUS L. Screwpine

Leaves mostly 5 to 6 cm. wide, gradually narrowed to the apex.
1. **P. tectorius** Soland.
Leaves 12 to 16 cm. wide, abruptly cuspidate at apex......2. **P. dubius** Spreng.

The plants are mostly natives of the East Indies. They have tall branched stems and many long, narrow, swordlike leaves whose margins are armed with small, sharp spines. The large and conelike fruit is composed of angled woody drupes. *P. tectorius* is planted at Ancón, Mount Hope Cemetery, and elsewhere. Large plants of what is perhaps *P. dubius* are growing near the railroad station in Balboa.

4. ALISMACEAE. Waterplantain Family

Flowers perfect, in elongate racemes. Achenes conspicuously beaked; plants erect, growing in mud or shallow water..............1. **ECHINODORUS.**
Flowers polygamous.
  Leaves broadly cordate; plants normally floating in water; lower flowers perfect....................................2. **LOPHOTOCARPUS.**
  Leaves lanceolate, acute at base; plants erect; lower flowers pistillate.
3. **SAGITTARIA.**

The genus *Helianthium* also is represented in Panama. Our plants of the family are stemless, with long-petioled, often cordate, several-nerved leaves and white flowers. The fruit is a head of small achenes.

1. ECHINODORUS L. Rich.

Pedicels very short, even in fruit, the inflorescence spikelike.
1. **E. bracteatus** Micheli.
Pedicels elongate, the inflorescence racemelike..:.......2. **E. tunicatus** Small.

Both species are common. *E. bracteatus* is known only from about the zone, and *E. tunicatus* only from Panama. In *E. tunicatus* the sepals are accrescent and inclose the fruit head. *E. muricatus* Griseb., described from Panama, is considered by monographers of the family a synonym of *E. macrophyllus* (Kunth) Micheli, but that species has not been found by recent collectors in Panama.

2. **LOPHOTOCARPUS** Durand

The only Central American species, *L. guyanensis* (H. B. K.) J. G. Smith, is frequent near the Pacific. It has oval to orbicular, deeply cordate leaves, rounded at apex.

3. **SAGITTARIA** L. ARROWHEAD

S. lancifolia L. grows in shallow water about the shores of Gatún Lake. The showy white flowers are 2 to 5 cm. broad, the fruit heads 1.5 cm. in diameter.

5. BUTOMACEAE. Butomus Family

The family is represented in Central America by a single genus.

1. **LIMNOCHARIS** Humb. & Bonpl.

The only species of the genus is *L. flava* (L.) Buchenau. It is a common plant in mud or shallow water, stemless, with numerous oblong-linear to nearly orbicular leaves. The few large yellow flowers form an umbel terminating a short scape; the 3 broad sepals persist and inclose the fruit head; the 3 petals are longer than the sepals.

6. POACEAE. Grass Family

(Contributed by A. S. Hitchcock)

Spikelets 1 to many-flowered, the reduced florets, if any, above the perfect florets (1 or 2 sterile lemmas below in Bambuseae, and in *Uniola*); articulation usually above the glumes; spikelets usually more or less laterally compressed.

Plants woody, arborescent or clambering. Spikelets 1 to many-flowered, 1 or 2 sterile lemmas below the perfect ones---------------**I. BAMBUSEAE.**

Plants herbaceous.

Stigmas 3; spikelets in a long spike or raceme; slender awns or stigmas coiled or contorted, holding the mature spikelets in a tangled mass.

Contorted portion consisting of the awns of the lemmas; blades broad, elliptic---------------**3. STREPTOCHAETA.**

Contorted portion consisting of the stigmas; blades narrow, elongate. **4. STREPTOGYNE.**

Stigmas 2.

Spikelets unisexual, 1-flowered, the plants monoecious--- **22. PHARUS.**

Spikelets perfect.

Spikelets 1-flowered, very flat, articulate below the glumes; glumes small or wanting---------------**VI. ORYZEAE.**

Spikelets if very flat more than 1-flowered, usually articulate above the glumes; glumes usually present.

Spikelets 1-flowered, in groups (short spikes) of 2 to 5, the groups (indurate, with 3 to 5 deep sinuses) racemose along a main axis, falling entire; lemma and palea thinner than the glumes--**IV. NAZIEAE.**

Spikelets not as above.

Spikelets sessile on one side of a continuous rachis (short-pedicellate in *Leptochloa*)---------------**V. CHLORIDEAE.**

Spikelets pedicellate in open or contracted, sometimes spikelike panicles.
  Spikelets 1-flowered..................**III. AGROSTIDEAE.**
  Spikelets 2 to many-flowered (some of them 1-flowered in *Orthoclada*)..............................**II. FESTUCEAE.**

Spikelets with 1 perfect terminal floret (disregarding those of the few monoecious genera and the staminate and neuter spikelets) and a sterile or staminate floret below (the lower perfect in *Isachne*) usually represented by a sterile lemma only, one glume sometimes (rarely both glumes) wanting; articulation below the spikelets, either in the pedicel, in the rachis, or at the base of a cluster of spikelets, the spikelets falling entire, singly, in groups, or together with joints of the rachis; spikelets, or at least the fruits, more or less dorsally compressed.
  Glumes membranaceous, the sterile lemma like the glumes in texture.
    Fertile lemma and palea thinner than the glumes. Fertile lemma awned from the summit..................................**VII. MELINIDEAE.**
    Fertile lemma and palea indurate or at least firmer than the glumes. **VIII. PANICEAE.**
  Glumes indurate; fertile lemma and palea hyaline or membranaceous, the sterile lemma (when present) like the fertile one in texture.
    Spikelets unisexual, the pistillate below, the staminate above, on the same inflorescence or in separate inflorescences..........**X. TRIPSACEAE.**
    Spikelets in pairs, one sessile and perfect, the other pedicellate and usually staminate or neuter (the pedicellate one sometimes obsolete, rarely both pedicellate); lemmas hyaline.........**IX. ANDROPOGONEAE.**

I. BAMBUSEAE

Keels of palea not winged..................................**1. BAMBUSA.**
Keels of palea winged......................................**2. GUADUA.**

II. FESTUCEAE

Plants tall and stout, usually more than 2 meters tall, with large plumy panicles; spikelets (at least the pistillate) with copious long silky hairs on the lemmas or rachilla.
  Spikelets unisexual; pistillate spikelets hairy, the staminate glabrous; plants dioecious, very tall, the blades saw-toothed..........**8. GYNERIUM.**
  Spikelets perfect; lemmas glabrous; rachilla hairy........**9. PHRAGMITES.**
Plants low or slender, mostly less than 1 meter tall.
  Blades broad, elliptic, showing transverse veins between the nerves; spikelets 1 or 2-flowered, in a diffuse panicle...............**6. ORTHOCLADA.**
  Blades linear, not showing transverse veins; spikelets several-flowered.
    Plants with long stout hard stolons........................**7. UNIOLA.**
    Plants without stolons...............................**5. ERAGROSTIS.**

III. AGROSTIDEAE

Spikelets awnless.....................................**11. SPOROBOLUS.**
Spikelets awned.
  Lemma terete, indurate, firmer than the glumes, ending below in a sharp pilose callus at least 0.5 mm. long; awns 3-parted, stout, the lateral awns sometimes minute or wanting...........................**12. ARISTIDA.**
  Lemma not indurate, of about the same texture as the glumes, the callus minute; awn simple.........................**10. MUHLENBERGIA.**

IV. NAZIEAE

A single genus..13. **ANTHEPHORA.**

V. CHLORIDEAE

Spikes racemosely arranged.
  Spikes short and relatively broad; upper floret 3-awned..19. **BOUTELOUA.**
  Spikes long and slender; upper floret not 3-awned.......14. **LEPTOCHLOA.**
Spikes digitate or nearly so.
  Spikelets with 2 or more perfect florets.
    Rachis of spike extending beyond the spikelets..16. **DACTYLOCTENIUM.**
    Rachis of spike not extending beyond the spikelets.......15. **ELEUSINE.**
  Spikelets with 1 perfect floret only.
    Sterile floret wanting; lemma obtuse...................17. **CYNODON.**
    Sterile floret present; lemma awned or mucronate..........18. **CHLORIS.**

VI. ORYZEAE

Glumes present; lemmas usually awned.........................20. **ORYZA.**
Glumes wanting; lemmas awnless..............................21. **LEERSIA.**

VII. MELINIDEAE

A single genus...23. **ARUNDINELLA.**

VIII. PANICEAE

Spikelets unisexual; plants monoecious. Blades broad; fruits bony-indurate.
  Panicles large, terminal on the culms and leafy branches, the pistillate spikelets above, the staminate below in the same panicle...........44. **OLYRA.**
  Panicles mostly axillary, consisting of a single pistillate spikelet and 1 to several staminate spikelets below..................45. **LITHACHNE.**
Spikelets perfect.
  Axis of inflorescence thickened and corky, flat, the spikelets sunken in the cavities in its joints. Plant creeping..........43. **STENOTAPHRUM.**
  Axis not thickened, the spikelets not sunken in it.
    Spikelets subtended or surrounded by 1 to many bristles or spines (sterile branchlets), these distinct or more or less connate at base, forming a false involucre.
      Bristles persistent; spikelets deciduous.................40. **SETARIA.**
      Bristles falling with the spikelets at maturity.
        Bristles slender, plumose, not united............41. **PENNISETUM.**
        Bristles united below, forming a bur..............42. **CENCHRUS.**
    Spikelets not subtended nor surrounded by bristles.
      Spikelets awned, in one-sided, simple or somewhat compound racemes (merely pointed in *Echinochloa colonum*).
        Blades lanceolate, broad and thin; longest awn on the first glume.
38. **OPLISMENUS.**
        Blades long and narrow; longest awn on the sterile lemma.
39. **ECHINOCHLOA.**
      Spikelets awnless.
        Spikelets in spikelike panicles or in one-sided, more or less spikelike racemes, the racemes digitate or racemose.
          Inflorescence a long narrow panicle, spikelike or with numerous appressed branches of pointed spikelets.
            Second glume inflated-saccate; blades linear..34. **SACCIOLEPIS.**
            Second glume not saccate; blades cordate at base.
35. **HYMENACHNE.**

- Inflorescence not long and narrow (racemes distant and appressed in *Panicum geminatum*).
  - Rachilla joint and adnate rudimentary first glume forming a swollen ringlike callus at the base of the spikelet. Racemes short, thick, silky .... **28. ERIOCHLOA.**
  - Rachilla joint not forming a ringlike callus.
    - Racemes solitary, the alternate spikelets facing in opposite directions .... **27. THRASYA.**
    - Racemes more than 1, or if solitary not as above.
      - First glume evident. Racemes one-sided, racemosely arranged along the main axis .... **31. PANICUM.**
      - First glume wanting (present in a few species of *Paspalum*) or very small. Spikelets in 2 to 4 rows in close one-sided racemes.
        - Spikelets solitary, oblong-elliptic, placed with the back of the fertile lemma (hence the second glume) turned away from the rachis .... **29. AXONOPUS.**
        - Spikelets placed with the back of the fertile lemma (hence the second glume) turned toward the rachis.
          - Lateral nerves of spikelet marginal .... **30. PASPALUM.**
          - Lateral nerves of spikelet between midnerve and margin.
            - Pubescence on spikelet short or none. **26. DIGITARIA.**
            - Pubescence on spikelet long-silky. **25. TRICHACHNE.**
- Spikelets in open or condensed panicles.
  - Spikelets globose, oblique on the pedicels. Culms usually woody. **33. LASIACIS.**
  - Spikelets usually not globose, not obliquely set on the pedicels.
    - Spikelets with 2 perfect florets .... **37. ISACHNE.**
    - Spikelets with 1 perfect floret.
      - Fertile lemma with broad scars at base. Glumes somewhat caudate .... **32. ICHNANTHUS.**
      - Fertile lemma not broadly scarred at base.
        - First glume wanting. Spikelets silky-hairy. **24. LEPTOCORYPHIUM.**
        - First glume present.
          - Fruit indurate, its margin inrolled; first glume usually shorter than the spikelet .... **31. PANICUM.**
          - Fruit cartilaginous, the margins flat; first glume as long as the spikelet .... **36. HOMOLEPIS.**

IX. ANDROPOGONEAE

- Spikelets all perfect.
  - Inflorescence a spikelike raceme.
    - Raceme solitary .... **49. POLYTRIAS.**
    - Racemes in pairs .... **57. ISCHAEMUM.**
  - Inflorescence a dense or somewhat open, woolly panicle.
    - Panicle dense, golden-brown, silky .... **48. ERIOCHRYSIS.**
    - Panicle white or pinkish.
      - Rachis continuous, the spikelets falling; spikelets of the pair unequally pedicellate .... **46. IMPERATA.**
      - Rachis breaking up into joints at maturity with the awnless spikelets attached; one spikelet sessile, the other pedicellate .... **47. SACCHARUM.**

Spikelets not all perfect, the sessile usually perfect, the pedicellate usually staminate or rudimentary.
  Pedicels thickened, the rachis joint and pedicel adnate, forming a short flat joint, this sunken in the open side of the globose first glume of the sessile spikelet. A branching annual.................58. **HACKELOCHLOA.**
  Pedicels not thickened.
    Fertile spikelet with a hairy-pointed callus formed of the attached supporting rachis joint or pedicel; awns strong......56. **TRACHYPOGON.**
    Fertile spikelet without a callus, the rachis disarticulating immediately below the spikelet; awns slender.
      Racemes reduced to one or few joints, these mostly peduncled in a simple or compound panicle.
        Pedicellate spikelets staminate...................54. **SORGHUM.**
        Pedicellate spikelets wanting, only the pedicel present.
55. **SORGHASTRUM.**
      Racemes of several to many joints, solitary, digitate, or aggregate.
        Pedicellate spikelets much larger than the sessile, almost concealing them, the first glume large and flat; racemes solitary on the branches.................................53. **DIECTOMIS.**
        Pedicellate spikelets sometimes as large as the sessile ones, usually smaller, the first glume not large and flat.
          Racemes few to several, digitate, on subcapillary flexuous peduncles. Joints and pedicel hyaline and balsamiferous between the thickened margins.............................52. **EUCLASTA.**
          Racemes 1 to many, the peduncles sometimes slender but not flexuous.
            Racemes in pairs supported or inclosed by a broad spathe, gathered in large compound panicles, the lowest pair of spikelets of one of the racemes alike, staminate or neuter. Aromatic grasses.............................51. **CYMBOPOGON.**
            Racemes single, in pairs, digitate, or numerous, sometimes supported by spathes; lowest pair of spikelets like the upper, one fertile and sessile, the other pedicellate, staminate or reduced.
50. **ANDROPOGON.**

X. TRIPSACEAE

Staminate and pistillate spikelets in separate inflorescences, the staminate in a terminal panicle (tassel), the pistillate in the axils of the leaves (ear).
60. **ZEA.**
Staminate and pistillate spikelets in separate parts of the same spike, the pistillate below.
  Spikes short, the 1 or 2-flowered pistillate part inclosed in a beadlike sheathing bract..61. **COIX.**
  Spikes many-flowered, the pistillate part breaking up into several 1-seeded joints; no beadlike sheathing bract.................59. **TRIPSACUM.**

1. **BAMBUSA** Schrad. Bamboo

The common bamboo, *B. vulgaris* Schrad. from Asia, is cultivated occasionally. It grows to a height of as much as 30 meters and a diameter of as much as 10 cm. The culms are green when young but usually turn yellow with age. A variety has yellow stems striped with green. Another species, *B. nana* Roxb., with small glaucous leaves, is used in tropical countries as a hedge plant and may be found in Panama. The usual Central American name for these plants is "bambú." In Panama *B. vulgaris* is called also "cañaza."

2. **GUADUA** Kunth

G. angustifolia Kunth, differing from *Bambusa vulgaris* in having spiny branches, is a native of northern South America, growing to about the same size as the common bamboo. The stems remain green. This species is employed in South America for making bamboo boards, used in the construction of houses. The culms are slit to allow flattening, then split down one side and spread into a board. Neither this nor the common bamboo has been observed to flower in Panama.

Two species of climbing bamboo are common in the forest of the Canal Zone. They have slender canes about as large as a lead pencil and have the numerous small leafy branches in verticils or fascicles at the nodes. The flowers have not yet been observed and the species can not be identified. *Arthrostylidium racemiflorum* Steud. has linear blades 5 mm. wide; *Chusquea simpliciflora* Munro has wider lanceolate blades. Their local names are "carrizo" and "carricillo."

3. **STREPTOCHAETA** Schrad.

S. sodiroana Hack. is an erect perennial with broad elliptic blades and elongate spikes of appressed spikelets whose long tendrillike awns intertwine in a tangled mass. It is found in the wet forest.

4. **STREPTOGYNE** Beauv.

S. crinita Beauv. is an erect perennial with narrow blades and a slender spike 30 to 50 cm. long of narrow spikelets about 3 cm. long, the long persistent stigmas curled and tangled.

5. **ERAGROSTIS** Host

- Palea ciliate on the keels, the cilia as long as the width of the lemmas. Plants annual.
  - Spikelets about 2 mm. long, pediceled; panicle open. 1. **E. amabilis** (L.) Wight & Arn.
  - Spikelets usually 3 to 4 mm. long, sometimes many-flowered, mostly subsessile; panicle spikelike, usually interrupted .... 2. **E. ciliaris** (L.) Link.
- Palea not long-ciliate.
  - Plants perennial.
    - Lemmas acuminate, the tips not appressed; plants mostly less than 50 cm. tall .... 3. **E. acutiflora** (H. B. K.) Nees.
    - Lemmas acute, the tips appressed; plants mostly more than 50 cm. tall. 4. **E. prolifera** (Swartz) Steud.
  - Plants annual.
    - Plants branched and creeping, forming mats. 5. **E. hypnoides** (Lam.) B. S. P.
    - Plants erect or spreading, not creeping and matlike.
      - Lemmas acuminate, 2 to 4 mm. long; spikelets sessile or nearly so.
        - Lemmas 4 mm. long; axils glabrous. 6. **E. simpliciflora** (Presl) Scribn.
        - Lemmas 2 mm. long; axils conspicuously pilose. 7. **E. maypurensis** (H. B. K.) Steud.
      - Lemmas acute or obtusish.
        - Spikelets 1.5 mm. wide; panicle capillary ..... 8. **E. pilosa** (L.) Beauv.
        - Spikelets 2 mm. wide; panicles somewhat condensed. 9. **E. tephrosanthos** Schult.

E. amabilis, *E. ciliaris*, *E. pilosa*, and *E. tephrosanthos* are small, rather delicate species growing in gardens and waste places. *E. prolifera* is a stout perennial found near the sea along Panama Bay. *E. hypnoides* is found on sandy shores of rivers. *E. acutiflora*, *E. simpliciflora*, and *E. maypurensis* grow in the savannas of the Pacific side.

6. **ORTHOCLADA** Beauv.

O. laxa (L. Rich.) Beauv. is a stoloniferous perennial with lanceolate blades and diffuse panicles with 1 to few spikelets at the ends of the finally stiffly divergent, capillary branches. It grows in rich, moist forests.

7. **UNIOLA** L.

U. pittieri Hack. is a conspicuous creeping perennial growing on the sandy beaches of Panama Bay. The stout stolons send up flowering culms with condensed pale panicles of large flat spikelets.

8. **GYNERIUM** Humb. & Bonpl.

G. sagittatum (Aubl.) Beauv. is a stout, reedlike grass as much as 10 meters tall, with culms clothed below with old sheaths (the blades having fallen), sharply serrate blades commonly 2 meters long and 4 to 6 cm. wide (forming a great fan-shaped summit to the sterile culms), and pale, plumy, densely flowered panicles 1 meter or more long, the slender branches drooping. On river banks and in low ground, forming dense colonies. Called uva grass and wild cane. The large, thick stems are much used in Central America for the construction of huts. They are employed also in the construction of stucco houses as a substitute for lath.

9. **PHRAGMITES** Trin. REED

P. communis Trin., the reed, grows to the height of 2 to 4 meters, with blades 20 to 40 cm. long and panicles 40 to 60 cm. long. It is found in dense masses in marshes. Rare in Panama; found in the vicinity of Colón.

10. **MUHLENBERGIA** Schreb.

M. tenuissima (Presl) Kunth is a delicate annual with a diffuse capillary panicle and very small spikelets. It has been found along the Tecumen River.

11. **SPOROBOLUS** R. Br. DROPSEED

Plants spreading by widely creeping rhizomes, gregarious.
1. **S. virginicus** (L.) Kunth.

Plants erect, without rhizomes.
  Glumes equal, much shorter than the spikelet-----2. **S. indicus** (L.) R. Br.
  Glumes unequal, the second about as long as the spikelet.
    Plants annual; blades short, flat, ciliate----------3. **S. ciliatus** Presl.
    Plants perennial; blades elongate, the lowermost sheaths felty-pubescent.
    4. **S. cubensis** Hitchc.

S. indicus is common on grassy hills, lawns, and savannas. It grows in small tufts with erect loose narrow panicles of small spikelets, and slender elongate blades tapering to a fine point. *S. virginicus* is common in the marshy flats of the Atlantic side. *S. ciliatus* is rather frequent on the savannas of the Pacific side. *S. cubensis* has been found at Frijoles.

12. ARISTIDA L.

Lateral awns minute or wanting.
  Plants perennial, mostly more than 50 cm. tall-----------1. **A. ternipes** Cav.
  Plants annual, mostly less than 50 cm. tall--------2. **A. jorullensis** Kunth.
Lateral awns developed.
  Plants annual, delicate; awns straight, about equal, 5 mm. long, supported by a twisted column-----------------------------3. **A. capillacea** Lam.
  Plants perennial, stout; awns, at least the central, curved or contorted.
    Central awn curved in a semicircle, 1.5 to 2 cm. long, the lateral awns about half as long------------------------4. **A. torta** (Nees) Kunth.
    Central awn about as long as the others, all about 1 cm. long, curved at base in a warped twist--------------------5. **A. recurvata** H. B. K.

A. ternipes has been found at Old Panama. *A. jorullensis* grows in open ground and savannas on the Pacific side. *A. capillacea* is so small and delicate that it may be overlooked. It is found in open ground on the Pacific side. Its local names are "lana de ratón" and "lanita de ratón" *A. torta* occurs on Ancón Hill and *A. recurvata* at Corozal.

13. ANTHEPHORA Schreb.

A. hermaphrodita (L.) Kuntze is an annual weed with erect spikes 5 to 10 cm. long, found in waste places.

14. LEPTOCHLOA Beauv.

Plants annual; sheaths papillose-pilose; racemes numerous, racemose along the main axis-------------------------------1. **L. filiformis** (Lam.) Beauv.
Plants perennial; sheaths smooth; racemes about 12, aggregate toward the summit of the culm-------------------------2. **L. virgata** (L.) Beauv.

L. filiformis is a weed in moist fields and waste places. *L. virgata* grows in thickets, open ground, and tidal flats.

15. ELEUSINE Gaertn.

E. indica (L.) Gaertn., goosegrass, is a spreading annual, common in waste places.

16. DACTYLOCTENIUM Willd.

D. aegyptium (L.) Richt., crowfoot grass, is a common annual weed of waste places.

17. CYNODON Pers.

C. dactylon (L.) Pers. is the well-known Bermuda grass found in all tropical countries at low altitudes. It is a creeping perennial with narrow, usually short blades, and 3 to 5 slender arcuate spikes at the apex of the short wiry culm. Common in open, rather dry ground; used as a lawn grass.

18. CHLORIS Swartz

Lemmas awnless, mucronate only; spikes dark brown; plant perennial.
1. **C. petraea** Swartz.
Lemmas awned; spikes pale or tawny; plant annual--2. **C. radiata** (L.) Swartz.

C. petraea is a glaucous, sparingly stoloniferous perennial found in open ground. *C. radiata* is a spreading weedy annual found in waste places.

19. BOUTELOUA Lag. GRAMA

Second floret a trifid naked awnlike rudiment. A cespitose decumbent perennial with several rather slender spikes..........**1. B. americana** (L.) Scribn.
Second floret well developed, the lemma evident.
  Plants perennial........................**2. B. filiformis** (Fourn.) Griffiths.
  Plants annual..........................**3. B. pilosa** (Hook. f.) Benth.

All the species are found in the savannas of the Pacific slope.

20. ORYZA L.

Plants annual; spikelets about 4 mm. wide, awned or awnless...**1. O. sativa** L.
Plants perennial; spikelets 2 mm. wide, awned............**2. O. latifolia** Desv.

Rice, ("arroz"), *O. sativa*, is cultivated here as it is throughout tropical America. It is an erect, somewhat succulent annual with drooping panicles of very flat, ribbed spikelets, long-awned or awnless. *O. latifolia* is 2 meters or more tall, growing in swamps and marshy places.

21. LEERSIA Swartz

L. hexandra Swartz is a scabrous slender perennial with extensively creeping stolons and small panicles of flat spikelets. It grows on the borders of ponds and ditches.

22. PHARUS L.

Fruit pubescent only at tip, slightly exceeding the glumes...**1. P. latifolius** L.
Fruit pubescent all over, 2 or 3 times as long as the glumes..**2. P. glaber** H. B. K.

Erect perennials about 50 cm. tall, with flat oblanceolate blades 15 to 25 cm. long and 3 to 6 cm. wide, and large open panicles. The cylindric fruits are clothed with hooked hairs. The fragile panicles break up readily and the pieces attach themselves by the hooked hairs to passing objects. Both species are found in wet forest. They are known locally by the name "pegapega."

23. ARUNDINELLA Raddi

Awn tightly twisted below, the column shorter than the second glume.
1. A. confinis (Schult.) Hitchc. & Chase.
Awn not tightly twisted below, the part below the bend exceeding the glume.
  Blades broad and flat, 1 to 2 cm. wide; plants robust, 1.5 to 2 meters tall; sheaths appressed-villous....................**2. A. deppeana** Nees.
  Blades narrow and more or less folded or convolute; plants slender, mostly less than 1 meter tall; sheaths smooth.
3. A. berteroana (Schult.) Hitchc. & Chase.

These are erect grasses with terminal, dense or rather lax, pale or brownish panicles, all growing on the Pacific side. *A. deppeana* is common on savannas and banks. By the West Indians it is called "foxtail." The other two species are infrequent, *A. berteroana* on rocks and *A. confinis* on grassy slopes.

24. LEPTOCORYPHIUM Nees

L. lanatum (H. B. K.) Nees is an erect tufted perennial with loose oblong panicles of silky spikelets, found on dry hillsides at Ancón.

25. TRICHACHNE Nees

T. insularis (L.) Nees is a coarse weedy perennial with drooping silky tawny panicles, found in open ground and waste places.

26. DIGITARIA Heist. CRABGRASS

Rachis narrowly winged on the margins, appearing flat or flattened-triangular.
  First glume small but distinct; spikelets about 3 mm. long.
    1. **D. sanguinalis** (L.) Scop.
Rachis not winged.
  Rachis sparsely beset with scattered spreading long hairs; spikelets lanceolate, 2.3 mm. long; fruit pale ---------- 2. **D. horizontalis** Willd.
  Rachis with no long hairs; spikelets ovate, about 2 mm. long; fruit brown.
    Pubescence on spikelets glandular ---------- 3. **D. singularis** Mez.
    Pubescence on spikelets not glandular ------ 4. **D. panicea** (Swartz) Urban.

Crabgrass, *D. sanguinalis* and *D. horizontalis*, are common weeds in gardens, lawns, and waste places. *D. panicea* and *D. singularis* are erect perennials occasionally found in the savannas of the Pacific side.

27. THRASYA H. B. K.

Raceme 10 to 20 cm. long; spikelets pilose.
  Rachis broadly winged, folding about the conspicuously pilose spikelets.
    1. **T. petrosa** (Trin.) Chase.
  Rachis scarcely winged, the spikelets pilose toward the summit and margins only ---------- 2. **T. hitchcockii** Chase.
Raceme 2 to 5 cm. long; spikelets glabrous. Rachis narrow.
    3. **T. campylostachya** (Hack.) Chase.

T. petrosa is found on the grassy hills of Taboga Island, and *T. campylostachya* on the savannas. *T. hitchcockii* grows in open grassland at Chorrera.

28. ERIOCHLOA H. B. K.

E. distachya H. B. K. is a small perennial with usually 2 pubescent racemes 1 to 2 cm. long, found on the savannas east of Panama.

29. AXONOPUS Beauv.

Rachis bearing stiff spreading golden hairs.
  Spikelets not sunken in the rachis, the long hairs borne below them.
    1. **A. aureus** Beauv.
  Spikelets sunken in the rachis, the hairs borne on the middle angle as well as margin of rachis ---------- 2. **A. chrysoblepharis** (Lag.) Chase.
Rachis not bearing stiff hairs.
  Plants stoloniferous, forming mats ------ 3. **A. compressus** (Swartz) Beauv.
  Plants not stoloniferous; bunch grasses.
    Blades flat, lax, elongate; glume and sterile lemma much exceeding the fruit ---------- 4. **A. centralis** Chase.
    Blades folded, rather firm; glume and sterile lemma scarcely exceeding the fruit.
      Spikelets with a dense row of pale golden hairs along the margains.
        6. **A. purpusii** (Mez) Chase.
      Spikelets sparsely pubescent at base and apex only or glabrous.
        Culms not rigid; spikelets less than 2 mm. long, dark-colored.
          5. **A. ater** Chase.
        Culms rigid; spikelets 3 mm. long, pale ----- 7. **A. poiophyllus** Chase.

The species of *Axonopus* resemble those of *Paspalum* but the spikelets are placed in the opposite position on the rachis and are usually oblong-elliptic rather than orbicular or ovate. *A. compressus*, the carpetgrass, is a common constituent of lawns, especially in the moister or somewhat shaded places. *A. purpusii* is common on the savannas east of Panama. *A. centralis* is found in the vicinity of Panama and on Taboga Island; and *A. poiophyllus* at the latter place. *A. aureus* and *A. chrysoblepharis* are handsome golden-yellow species found sparingly in the vicinity of Panama.

30. PASPALUM L. SIDESEED

Rachis broadly winged.
  Spikelets minute, whitish against the broad green rachis; plants aquatic.
  1. P. repens Berg.
  Spikelets large, brownish, pectinately stiff-ciliate; plants terrestrial.
  2. P. pectinatum Nees.
Rachis not winged.
  Spikelets with a broad stiff lacerate margin. Annual.
  3. P. fimbriatum H. B. K.
  Spikelets not lacerate-margined.
    Inflorescence a large flabellate panicle of numerous racemes, the spikelets solitary. Stout perennials, creeping at base.
      Spikelets glabrous; racemes relatively thick-- **4. P. fasciculatum** Willd.
      Spikelets with long silky hairs on the margin; racemes very slender.
      5. P. saccharoides Nees.
    Inflorescence not flabellate, or if slightly so, the spikelets in pairs.
      Racemes 2, conjugate at the summit of the culm, rarely a third below; spikelets solitary.
        Spikelets lanceolate, acuminate, glabrous. Culms erect from stout creeping rhizomes. (Racemes frequently 3 in Panama plants).
        6. P. vaginatum Swartz.
        Spikelets broadly elliptic to orbicular.
          Plants stoloniferous; spikelets concavo-convex, pale golden, sparsely long-silky around the margin--------- **7. P. conjugatum** Berg.
          Plants not stoloniferous.
            Spikelets about 1.5 mm. long, orbicular, some of them usually sprinkled with globular hairs; slender annual. (Racemes rarely solitary)------------------- **8. P. multicaule** Poir.
            Spikelets more than 2 mm. long; perennials in dense clumps from short rhizomes.
              Basal innovations subglobular, resembling bulblets; second glume obscurely pubescent, minutely ciliate on the margin.
              9. P. subciliatum Chase.
              Basal innovations linear; spikelets entirely glabrous.
                Spikelets 2.2 to 2.3 mm. long. (Racemes rarely 3 in Panama plants) ------------------------- **10. P. minus** Fourn.
                Spikelets about 3 mm. long------- **11. P. notatum** Flügge.
      Racemes 1 to many, racemose, not conjugate; spikelets paired except in nos. 16, 17, and 18.
        Second glume as well as first wanting; spikelets with a tuft of stiff bronze hairs below the sterile lemma. Erect perennial with pilose foliage.
        12. P. gardnerianum Nees.

Second glume developed; no tuft of hairs below the sterile lemma.
  Fruit dark brown and shining at maturity.
    Plants annual, mostly pubescent; spikelets orbicular; racemes short and thick. (The Panama specimen is exceptional in that the sterile lemma is indurate and first glume developed.) 13. **P. convexum** Humb. & Bonpl.
    Plants perennial; spikelets obovate to suborbicular.
      Culms mostly 20 to 40 cm. tall, spreading; racemes mostly 2 to 4; spikelets suborbicular-obovate; sterile lemma flat. 14. **P. centrale** Chase.
      Culms more than 50 cm. tall, erect or suberect; racemes few to several; spikelets obovate; sterile lemma finely undulate inside the slightly raised margin__15. **P. plicatulum** Michx.
  Fruit pale or stramineous at maturity.
    Racemes 1 to few, if as many as 5 the spikelets minute and solitary.
      Spikelets solitary (not more than 1.7 mm. long); racemes mostly 3.
        Annual, tufted; foliage pilose______16. **P. parviflorum** Rohdé.
        Perennial, widely creeping.
          Foliage glabrous; spikelets orbicular, 1 mm. long. 17. **P. orbiculatum** Poir.
          Foliage pilose; spikelets narrowly ovate, 1.7 mm. long. 18. **P. standleyi** Chase
      Spikelets paired, at least 1.5 mm. long; racemes falcate, mostly solitary, terminal and axillary on slender peduncles.
        Racemes and blades elongate; spikelets oblong-elliptic, more than 2.5 mm. long. First glume developed, minute in the upper, mostly well developed in the lower, of the pair of spikelets; foliage coarsely pilose__19. **P. pilosum** Lam.
        Racemes 2 to 8 cm. long, blades mostly less than 10 cm. long; spikelets broadly obovate to suborbicular, less than 2 mm. long.
          Plants widely creeping; spikelets obovate, turgid.
            First glume developed; spikelets 1.5 mm. long. 20. **P. decumbens** Swartz.
            First glume wanting; spikelets 1.8 mm. long. 21. **P. nutans** Lam.
          Plants tufted, not creeping; spikelets suborbicular, scarcely turgid. Racemes of the main culm frequently 2. 22. **P. propinquum** Nash.
    Racemes numerous, if as few as 6, the spikelets more than 3 mm. long.
      Plants annual. Spikelets minute, pale, pubescent. 23. **P. microstachyum** Presl.
      Plants perennial.
        Spikelets about 1.3 mm. long, hemispherical, pubescent, densely crowded. Foliage coarsely pubescent. 24. **P. paniculatum** L.
        Spikelets 1.7 mm. or more long.
          Pedicel of the primary spikelet of the pair nearly as long as the spikelet, the elliptic, minutely pubescent spikelets 1.7 to 1.8 mm. long, rather loosely spreading. 25. **P. violascens** Mez.

Pedicels much shorter than the imbricate crowded spikelets.
  Robust perennials; blades very scabrous on the margins.
   Rachis densely long-ciliate; spikelets 1.8 to 2 mm. long, suborbicular, glabrous---------**26. P. densum** Poir.
   Rachis not or very sparsely ciliate; spikelets 3 to 3.5 mm. long.
    Spikelets 3 mm. long, blunt, minutely pubescent, silky-hairy around the margin of the glume and summit of the sterile lemma---------**27. P. virgatum** L.
    Spikelets 3.5 mm. long, abruptly pointed, softly ciliate around the margin of the glume or glabrous. **28. P. acutum** Chase.

The genus *Paspalum* can be recognized by the spikelike one-sided racemes of plano-convex, mostly obovate or suborbicular spikelets. *P. paniculatum* is a common weed in waste places. *P. repens* is a water grass common in Gatún Lake and along ponds and rivers. *P. fimbriatum* is an annual weed of waste places, peculiar in having the spikelets with a fimbriate margin. *P. saccharoides* is unusual in having silky-villous spikelets in fasciculate drooping racemes. It grows on shady banks. *P. vaginatum*, with creeping rhizomes, is found along muddy seashores. The Panama specimens often have 3 racemes. *P. fasciculatum* is a robust gregarious species common in marshes, with long blades 2 to 3 cm. wide. *P. virgatum* is a large bunch grass as much as 2 meters tall with sharp-edged blades, found in moist or marshy ground. *P. densum* is similar but has a dense narrow panicle of numerous ascending racemes. *P. notatum* and *P. minus*, common on the savannas of the Pacific side, are recognized by the divergent pair of racemes. *P. conjugatum* also has a pair of racemes, but they are more slender, drooping, and yellowish green. This is common in open or partly shaded, moist soil. It forms long runners. *P. plicatulum* is common in grassland and open places.

31. PANICUM L.

Plants annual.
 Panicles consisting of several more or less secund, spikelike racemes. Fruit transversely rugose; glumes and sterile lemma reticulate-veined. **1. P. fasciculatum** Swartz.
 Panicles open.
  Blades ovate-lanceolate, thin; spikelets a little more than 1 mm. long. **2. P. trichoides** Swartz.
  Blades linear; spikelets more than 2 mm. long.
   First glume not more than one-fourth the length of the spikelet, truncate. **3. P. chloroticum** Nees.
   First glume as much as half the length of the spikelet, acute. **4. P. hirticaule** Presl.
Plants perennial.
 Spikelets short-pediceled along one side of the panicle branches.
  Spikelets bearing 2 crateriform glands----------**5. P. pulchellum** Raddi.
  Spikelets without glands, glabrous.
   Blades lanceolate or ovate-lanceolate; glumes strongly carinate.
    Blades not more than 5 cm., usually 2 to 3 cm., long; plants creeping. **6. P. stoloniferum** Poir.
    Blades usually more than 5 cm. long; culms erect from a decumbent base------------------------------**7. P. frondescens** Meyer.

Blades linear; glumes not carinate.

Fruit rugose.

Nodes bearded; branches of panicle spreading. **8. P. barbinode** Trin.

Nodes glabrous; branches of panicle appressed. **9. P. geminatum** Forsk.

Fruit not rugose.

Second glume shorter than the spikelet; panicle 20 to 40 cm. long---------------------**10. P. stagnatile** Hitchc. & Chase.

Second glume as long as the spikelet; panicle usually less than 20 cm. long.

Blades narrowed at base-----------------**11. P. laxum** Swartz.

Blades cordate or truncate at base.

Panicle of numerous simple, spikelike, conspicuously secund racemes, the rachis usually pilose with long spreading hairs.

Culms as much as 2 meters long; panicles 25 to 30 cm. long-------------**12. P. milleflorum** Hitchc. & Chase.

Culms not more than 1 meter long; panicles 5 to 15 cm. long------------------------**13. P. pilosum** Swartz.

Panicle branches not conspicuously secund, the lower again branching.

Nodes glabrous-------------------**14. P. boliviense** Hack.

Nodes pubescent-------------**15. P. polygonatum** Schrad.

Spikelets in open or contracted panicles, the branches not one-sided racemes.

Fruit transversely rugose----------------------**16. P. maximum** Jacq.

Fruit not transversely rugose.

Blades as much as 1 meter long and 6 cm. wide; panicle as much as 60 cm. long and 40 cm. wide---------------**17. P. grande** Hitchc. & Chase.

Blades narrower; panicles smaller (except in *P. megiston*).

Fruit crested at the apex; spikelets 5.5 to 6 mm. long. Plants widely creeping at base------------------**18. P. zizanioides** H. B. K.

Fruit not crested; spikelets less than 5 mm. long.

Panicles 40 to 60 cm. long, the numerous elongate branches in verticils------------------------------**19. P. megiston** Schult.

Panicles mostly much less than 40 cm. long; branches not in verticils.

Spikelets somewhat hirsute.

Culms slender, straggling; spikelets not turgid; glumes and sterile lemma hirsute along the margins. **20. P. haenkeanum** Presl.

Culms stout, erect or nearly so; spikelets turgid, sparsely hirsute. **21. P. rudgei** Roem. & Schult.

Spikelets glabrous.

Panicles narrow and few-flowered; culms erect, wiry, 20 to 40 cm. tall------------------**22. P. stenodoides** Hubbard.

Panicles open; culms not wiry.

Leaves mostly in a basal cluster; plant low and weak. **23. P. strigosum** Muhl.

Leaves not in a basal cluster; culms stout and erect.

Culms straggling------------**24. P. trichanthum** Nees.

Culms erect.

Culms as much as 1 cm. thick; blades 2 cm. or more wide; spikelets about 2 mm. long--**25. P. hirsutum** Swartz.

Culms slender; blades about 1 cm. wide or less; spikelets 3 mm. long----------**26. P. ghiesbreghtii** Fourn.

Two species of *Panicum* are cultivated for forage, *P. maximum* and *P. barbinode.* The first one, called Guinea grass, is an erect tufted perennial, 1 to 2.5 meters tall, with creeping rootstocks, more or less hirsute sheaths, and open panicles 20 to 50 cm. long, the oblong green spikelets about 3 mm. long, the first glume obtuse and only one-third as long as the spikelet. Guinea grass is grown on rather dry ground for pasture and for green feed throughout tropical regions. The second species, Para grass ("hierba de Pará"), is a much-branched straggling and creeping plant, sending up flowering culms 1 to 2 meters tall, with villous nodes and sheaths, glabrous flat blades, and panicles 10 to 20 cm. long, the densely flowered branches rather distant, spreading, 3 to 6 cm. long, the glabrous spikelets about 3 mm. long. Para grass is grown in wet places, where it finally forms a dense tangle of branching creeping stems. It is used for pasture and green feed throughout tropical America at low altitudes.

P. fasciculatum is a common weed in waste places. It is an annual as much as 1 meter tall with a yellow to dark brown panicle, consisting of a cluster of spike-like racemes 5 to 10 cm. long, the turgid pointed glabrous recticulate spikelets about 2.5 mm. long. The local names are "espigadilla" and "granadilla."

P. laxum and *P. pilosum* are common along ditches, in moist woods, and in moist places generally. The latter is called "grama de camino." *P. trichoides* is a little branching annual with ovate-lanceolate flat thin blades and large, very open, capillary panicles of spikelets only a little more than 1 mm. long. It is found in woods and is also a weed in cultivated soil, especially in shady places. *P. grande* is a conspicuous marsh grass found often in large masses along the margins of Gatún Lake and quiet fresh water generally. Before flowering it has the aspect of some kind of lily because of its broad elliptic blades.

32. ICHNANTHUS Beauv.

Plants delicate, 10 to 20 cm. tall; the blades 2 to 5 cm. long, 4 to 10 mm. wide------------------------------1. **I. tenuis** (Presl) Hitchc. & Chase.
Plants stouter, 30 to 150 cm. tall; blades mostly more than 1 cm. wide.
  Blades lanceolate, 1 to 2 cm. wide, glabrous--2. **I. pallens** (Swartz) Munro.
  Blades oval to ovate-lanceolate, 1.5 to 3.5 cm. wide, scabrous above and often pubescent beneath--------------3. **I. axillaris** (Nees) Hitchc. & Chase.

All the species are shade-loving plants, being found in the jungle, moist thickets, and shady ravines. The commonest species is *I. pallens.* This and *I. tenuis* sometimes produce abnormal spikelets in which the sterile lemmas are greatly multiplied, forming elongate curved spikelets as much as 2 cm. long.

33. LASIACIS (Griseb.) Hitchc.

Culms erect, simple, herbaceous; blades as much as 40 cm. long and 5 cm. wide, deeply cordate-clasping------------------1. **L. procerrima** (Hack.) Hitchc.
Culms much branched, woody; blades mostly less than 20 cm. long, narrowed at base or somewhat cordate.
  Ligule noticeable, brownish, about 2 mm. long; plants not high-climbing, decumbent and rooting at base, forming a tangled mass with no strong central cane; blades narrow, scabrous on upper surface.
    2. **L. oaxacensis** (Steud.) Hitchc.
  Ligule inconspicuous, hidden within the mouth of the sheath; plants high-climbing, forming a strong central cane; blades glabrous or pubescent, not scabrous.

Blades glabrous on both surfaces.
  Spikelets ovoid, 4 mm. long; panicle few-flowered, 5 to 10 cm. long; branches strongly zigzag, the branchlets divaricate or reflexed; blades narrowly lanceolate, firm, mostly less than 1 cm. wide (sometimes wider on vigorous shoots)............**3. L. divaricata** (L.) Hitchc.
  Spikelets globose, 3 mm. long; panicles many-flowered, usually 15 to 25 cm. long, or more on the primary branches; branches straight or arcuate, not zigzag; blades mostly more than 1.5 cm. wide. **4. L. globosa** Hitchc.
Blades pubescent on one or both surfaces (sometimes glabrous in *L. ruscifolia* with compactly flowered panicles).
  Blades narrowly lanceolate, averaging 8 to 10 times as long as wide; panicle large and open; spikelets 4 to 5 mm. long. **5. L. sorghoidea** (Desv.) Hitchc. & Chase.
  Blades ovate-lanceolate or elliptic, sometimes lanceolate, often more or less cordate-clasping; panicle often compact or at least the branches commonly compactly flowered; spikelets 3 to 4 mm. long. **6. L. ruscifolia** (H. B. K.) Hitchc.

The species (with the exception of *L. procerrima*) are woody and hence are often popularly classed with the small bamboos. The commonest species is *L. sorghoidea*, found in thickets and along the edge of the jungle. *L. ruscifolia* is fairly common in similar situations, especially in the coastal thickets of Panama Bay. *L. divaricata* has been found at Alhajuela and *L. globosa* on Taboga Island. *L. oaxacensis* occurs in the vicinity of Gatún Lake. *L. procerrima* is very different in aspect from the other species but agrees with them in the shape and structure of the spikelets. It is found here and there in thickets or open ground throughout the Zone. About the Zone *L. ruscifolia* is known as "carrizo" and *L. sorghoidea* as "carricillo" and "millo."

34. **SACCIOLEPIS** Nash

S. myuros (Lam.) Chase is a slender glabrous annual as much as 1 meter tall with elongate compact spikelike panicles, found in marshes and wet places.

35. **HYMENACHNE** Beauv.

Inflorescence dense, spikelike............**1. H. amplexicaulis** (Rudge) Nees.
Inflorescence long and narrow with ascending branches, not spikelike. **2. H. donacifolia** (Raddi) Chase.

H. amplexicaulis is common in the marshes of the Gatún Lake region. *H. donacifolia* has been found only in the marshes of the Tecumen River.

36. **HOMOLEPIS** Chase

H. aturensis (H. B. K.) Chase is a creeping grass with upright flowering culms 30 to 50 cm. tall. It grows in ditches, wet places, moist thickets, and open ground.

37. **ISACHNE** R. Br.

I. polygonoides (Lam.) Doell is a small creeping branching plant, rooting at the nodes, the flowering culms 20 to 30 cm. tall, with small open panicles. It is found in grassy marshes, wet meadows, and ditches.

38. OPLISMENUS Beauv.

Plants annual; awns antrorsely scabrous.......**1. O. burmanni** (Retz.) Beauv.
Plants perennial; awns smooth..................**2. O. hirtellus** (L.) Beauv.

Both species are common, the first a weed in shady open ground, the second in moist woods and shady banks. In Panama *O. burmanni* is called "pajita de ratón."

39. ECHINOCHLOA Beauv.

Racemes simple, rather distant, 1 to 2 cm. long; spikelets crowded in about 4 rows, the awn of the sterile lemma reduced to a short point; blades 3 to 6 mm. wide..................................**1. E. colonum** (L.) Link.
Racemes more or less branched, usually more than 2 cm. long; spikelets irregularly crowded and fascicled, the awn of the sterile lemma as much as 1 cm. long..................**2. E. crusgalli crus-pavonis** (H. B. K.) Hitchc.

E. colonum is a common weed in moist waste places and along ditches. The culms are 20 to 40 cm. long, the panicle erect, with several distant appressed racemes. *E. crusgalli crus-pavonis* is found in marshes and wet places, often in water. It is an erect grass, 50 to 100 cm. or more tall, with a soft, purplish, nodding, rather dense panicle.

40. SETARIA Beauv. FOXTAIL

Blades narrowly elliptic, plaited; bristles below only a part of the spikelets.
    Plants perennial, as much as 4 meters tall...**1. S. paniculifera** (Steud.) Fourn.
    Plants annual, usually less than 1 meter tall....**2. S. barbata** (Lam.) Kunth.
Blades linear-lanceolate to linear; bristles below all the spikelets.
    Bristles below each spikelet numerous, at least more than 5. Panicle dense, cylindric, spikelike.............**3. S. geniculata** (Lam.) Beauv.
    Bristles below each spikelet 1 or, by the abortion of the spikelets, 2 or 3.
        Bristles retrorsely scabrous.
            Plants perennial; spikelets globose or nearly so, 2 mm. long. **4. S. tenax** (L. Rich.) Desv.
            Plants annual; spikelets ovoid, 1.5 mm. long.....**5. S. scandens** Schrad.
        Bristles antrorsely scabrous. Panicle yellowish or brownish, the bristles 1 to 2 cm. long................**6. S. vulpiseta** (Lam.) Roem. & Schult.

S. geniculata is very common on grasslands and in waste places. It is a perennial with culms mostly 30 to 50 cm. tall, and yellow or purple panicles, the bristles about as long as the spikelets or exceeding them 2 or 3 times, the longer bristles developed under conditions of greater moisture. *S. paniculifera* is a conspicuous grass with its large spreading panicles as much as 70 cm. long. It is found in moist ground and on shady banks. *S. vulpiseta* is fairly common in thickets and on bushy slopes. It is a robust grass with dense, evenly flowered, very bristly panicles as much as 30 cm. long and 3 cm. wide. The local names are "pajón" and "rabo de mono," and by the West Indians it is called "mongoose-tail." *S. tenax* occurs on Taboga Island and *S. scandens* at Alhajuela. *S. barbata* is an Asiatic species introduced at Cerro Gordo.

41. PENNISETUM L. Rich.

Represented only by *P. setosum* (Swartz) L. Rich., from Taboga Island. The handsome purple panicles are dense and spikelike, soft with the numerous feathery bristles.

42. CENCHRUS L.

Burs, excluding bristles, not more than 4 mm. wide, numerous, crowded in a long spike; lobes of the involucre interlocking, not spinelike..1. **C. viridis** Spreng.

Burs, excluding the bristles, 5 to 7 mm. wide, not densely crowded; lobes of involucre erect or nearly so or rarely one or two lobes loosely interlocking, the tips spinelike..........2. **C. echinatus** L.

The species of *Cenchrus* are called sandbur. The burs at maturity separate from the rachis and stick to clothing by the retrorsely barbed spines. Both species are common in fields, grassland, and waste places. Locally they are given the names "cadillo" and "pega-pega."

43. STENOTAPHRUM Trin.

S. secundatum (Walt.) Kuntze, called St. Augustine grass in Florida, was found at the mouth of the Chagres River by Fendler in 1850. It is a seacoast species with creeping flat stems and flat spikes that disjoint at maturity.

44. OLYRA L.

O. latifolia L. is a somewhat woody, clambering grass with oblong-lanceolate blades about 20 cm. long and 5 cm. wide, and open panicles 10 to 15 cm. long, growing in copses and on shady banks. The fruits are bony-indurate. In Panama this grass is called "carricillo."

45. LITHACHNE Beauv.

L. pauciflora (Swartz) Beauv., a tufted perennial 30 to 50 cm. tall, growing in moist woods, has been found at Las Cruces.

46. IMPERATA Cyrillo

Imperata contracta (H. B. K.) Hitchc. is an erect perennial about a meter tall with a narrow feathery inflorescence. It is found rather infrequently in low grassy places. Known locally as "hierba guayacán."

47. SACCHARUM L. SUGARCANE

This well-known giant grass is cultivated throughout the tropical regions of the world. The tall stems are surmounted by a large silvery pink plumelike panicle. The Spanish name is "caña de azúcar;" the flower panicles are called in Salvador "chipustes."

48. ERIOCHRYSIS Beauv.

E. cayennensis Beauv. is a slender grass 1 to 2 meters tall with a compact, silky, golden brown panicle 10 to 12 cm. long. It grows in open grassy marshes.

49. POLYTRIAS Hack.

The single species, *P. amaura* (Büse) Kuntze, native of the East Indies, has been introduced in lawns at Balboa and on Barro Colorado Island. It is a spreading perennial that promises well as a lawn grass.

50. ANDROPOGON L. BEARDGRASS

Racemes solitary, terminating the culms and branches.

Plants annual. Culms weak, decumbent; blades obtuse, mostly 1 to 3 cm. long; peduncles capillary, spreading..........1. **A. brevifolius** Swartz.

Plants perennial.
  Rachis of racemes conspicuously flexuous, very slender, the spikelets spreading .... 2. **A. condensatus** H. B. K.
  Rachis straight, the spikelets appressed or narrowly ascending.
    Sessile spikelet about 5 mm. long; blades 2 to 5 mm. wide. 3. **A. semiberbis** (Nees) Kunth.
    Sessile spikelet about 4 mm. long, 1 mm. wide; blades mostly not more than 1.5 mm. wide .... 4. **A. tener** (Nees) Kunth.
Racemes more than one at the summit of the culms and branches.
  Racemes several or numerous, forming an exserted panicle.
    Racemes several, slender, fascicled, gray-pilose ...... 5. **A. ischaemum** L.
    Racemes numerous, crowded along an axis forming a silvery woolly dense panicle .... 6. **A. saccharoides** Swartz.
  Racemes in pairs (2 to 5 in *A. selloanus*) at the ends of the peduncles, the pairs usually supported by spathes, these often in compound clusters or panicles.
    Spikelets awnless.
      Plants robust, 1 to 2 meters tall; spathes aggregate in a corymbose, usually dense inflorescence .... 7. **A. bicornis** L.
      Plants slender, usually less than 1 meter tall; spathes not aggregate.
        Sessile spikelets about 3 mm. long; blades usually not more than 2 mm. wide, the apex acuminate .... 8. **A. leucostachys** H. B. K.
        Sessile spikelets about 4 mm. long; blades 3 to 5 mm. wide, the apex boat-shaped .... 9. **A. selloanus** (Hack.) Hack.
    Spikelets awned.
      Awns geniculate, twisted below ...... 10. **A. angustatus** (Presl) Steud.
      Awns straight, delicate.
        Racemes aggregate in a dense, club-shaped or corymbose inflorescence, the ultimate spathes not more than 2 mm. wide, rarely equaling their racemes .... 11. **A. glomeratus** (Walt.) B. S. P.
        Racemes not aggregate, the ultimate spathes 3 to 5 mm. wide, much exceeding their racemes .... 12. **A. virginicus** L.

The three most common and conspicuous species are *A. bicornis*, *A. condensatus*, and *A. glomeratus*. They are erect bunch grasses, 1 to 2 meters tall, with a club-shaped inflorescence. The first two are found in open ground and on grassy hills; the third prefers moist savannas. *A. angustatus* grows in dry fields and prairies on the Pacific side. *A. brevifolius* is a delicate vinelike species found especially on the sides of moist cuts or ditches. *A. leucostachys* is a low bunch grass of dry or rocky hills; the small inflorescence is silky white. *A. selloanus* is similar but has a tawny inflorescence and is less common. *A. saccharoides*, with tall erect stems and narrow woolly-white panicles 5 to 15 cm. long, is found in the savannas of the Pacific side. *A. semiberbis* grows on grassy hills; it is common on Taboga Island. *A. tener*, a small bunch grass of the savannas, and *A. virginicus*, a wandlike species of grassy hills, are not common. *A. ischaemum* is a European species recently introduced in lawns and grassland. In Panama *A. bicornis* is called "rabo de venado."

51. CYMBOPOGON Spreng.

C. citratus (DC.) Stapf, the lemon grass, is cultivated here and there throughout tropical America. It appears never to produce flowers in America and is propagated by division of the roots. The usual name in Central America is "hierba de limón."

52. **EUCLASTA** Franch.

E. condylotricha (Hochst.) Stapf is a weak-stemmed annual 1 to 2 meters long, found on shady banks among other vegetation.

53. **DIECTOMIS** H. B. K.

The single species, *D. fastigiatus* (Swartz) H. B. K., is a slender annual, common on dry hills and open ground on the Pacific side. It is sometimes a weed in lawns.

54. **SORGHUM** Pers.

Johnson grass, *S. halepense* (L.) Pers., widely introduced in the warmer parts of America, is found occasionally in waste places. The common sorghum, *S. vulgare* Pers., in some of its forms, such as Jerusalem corn, chicken corn, Kafir corn, or durra, may be occasionally cultivated. Sudan grass, *S. vulgare sudanense* (Piper) Hitchc., has been observed in grain fields.

55. **SORGHASTRUM** Nash

S. incompletum (Presl) Nash, a weak annual 1 to 2 meters long, with long awns that form a tangled cluster, has been found at Juan Díaz.

56. **TRACHYPOGON** Nees

T. montufari (H. B. K.) Nees is an erect savanna grass confined to the open grassy plains on the Pacific side. It is common on Taboga Island.

57. **ISCHAEMUM** L.

First glume strongly rugose across the back..............1. **I. rugosum** Salisb.
First glume smooth across the back.........................2. **I. ciliare** Retz.

Both species are introduced and are found in fields and waste places. *I. ciliare* is common in lawns at Ancón.

58. **HACKELOCHLOA** Kuntze

The single species, *H. granularis* (L.) Kuntze, is a freely branching annual that grows in fields and waste places as a weed. It is introduced from the Old World.

59. **TRIPSACUM** L.

Tripsacum dactyloides L. is widespread in North America and extends into eastern South America. It has been collected here only on Sosa Hill.

60. **ZEA** L.

The only species is *Z. mays* L., maize or Indian corn, cultivated for the seed and for forage.

61. **COIX** L.

Coix lachryma-jobi L., Jobs-tears, is occasionally cultivated for the hard pearly or drab beadlike fruits which are used for ornament. Plants are sometimes found growing in waste places as escapes from cultivation. The Central American name is "lágrimas de San Pedro."

7. CYPERACEAE. Sedge Family

Flowers partly perfect.
  Scales of the spikelets 2-ranked; perianth none.
    Spikelets with only one perfect flower, arranged in a dense head or cluster of heads........1. **KYLLINGA.**
    Spikelets usually with 2 to many perfect flowers, variously arranged. 2. **CYPERUS.**
  Scales spirally imbricate; perianth of bristles often present.
    Empty scales at base of spikelet 1 or 2 or none.
      Base of style persistent upon the achene as a tubercle.
        Spikelet one; leaves reduced to basal sheaths; perianth of bristles usually present........3. **ELEOCHARIS.**
        Spikelets more than one; leaves well developed; perianth none. 4. **STENOPHYLLUS.**
      Base of style not persistent.
        Flowers without inner scales.
          Base of style swollen; bristles none........5. **FIMBRISTYLIS.**
          Base of style not swollen; bristles present. Perennial. 6. **SCIRPUS.**
        Flowers with one or more inner scales.
          Flowers with 3 broad stipitate scales alternating with bristles. Perennial........7. **FUIRENA.**
          Flowers with 2 hyaline scales and no bristles ....8. **LIPOCARPHA.**
    Empty scales at base of spikelets 3 or more.
      Style 3-cleft. Perennials.
        Fertile flower axillary; plants large and coarse........9. **MARISCUS.**
        Fertile flower pseudo-terminal; plants small........10. **REMIREA.**
      Style 2-cleft.
        Spikelets compressed, clustered in a single head; bristles none. Spikelets white or pale brownish; head subtended by leaflike bracts. 11. **DICHROMENA.**
        Spikelets terete, usually paniculate or corymbose; bristles usually present. 12. **RYNCHOSPORA.**
Flowers unisexual.
  Fertile flower in each spikelet one, naked, terminal. Large perennial with broad leaves........13. **HYPOLYTRUM.**
  Fertile flowers often more than one, each subtended by a scale, lateral.
    Fertile flower basal........14. **SCLERIA.**
    Fertile flower pseudoterminal........15. **CALYPTROCARYA.**

Besides these genera, the following additional ones are represented elsewhere in Panama: *Ascolepis*, *Mapania*, *Uncinia*, and *Carex*. The members of this family are grasslike plants of little economic importance and of scant general interest.

1. KYLLINGA Rottb.

Plants annual; rootstocks absent, the culms cespitose.
  Fertile scale of the spikelet scabrous-ciliate on the keel, not glandular. 1. **K. pumila** Michx.
  Fertile scale smooth on the keel, bearing a few red glands. 2. **K. odorata** Vahl.
Plants perennial, usually with long rootstocks, the culms not cespitose.
  Leaf blades absent, the leaves reduced to scarious colored sheaths. 3. **K. peruviana** Lam.

Leaf blades present.
  Leaves much shorter than the culms; culms 2 to 2.5 mm. thick. 4. **K. pungens** Link.
  Leaves usually equaling the culms; culms 1 mm. thick. 5. **K. brevifolia** Rottb.

Only one other species is known from Central America, *K. nudiceps* Clarke, confined to Cocos Island, Costa Rica. The species are mostly small plants, the green spikelets in one or few sessile terminal heads subtended by leaflike bracts. *K. peruviana* and *K. pungens* are plants of seashores. *K. pumila* is one of the most common sedges of the Canal Zone.

2. CYPERUS L. FLAT-SEDGE

Style branches 2. Spikelets spicate.
  Surface of the achene transversely undulate-lineate, the cells longitudinally oblong. Annual..................................1. **C. flavescens** L.
  Surface of the achene not transversely undulate, the cells quadrate.
    Plants annual; scales not closely appressed...........2. **C. fugax** Liebm.
    Plants perennial; scales closely appressed..............3. **C. odoratus** L.
Style branches 3.
  Rachis of the spikelet deciduous from the inflorescence.
    Rachis of the spikelet breaking up into 1-fruited joints. Spikelets terete, slender, elongate; plants perennial.
      Spikelets about 3 mm. thick............4. **C. hayesii** (Clarke) Standl.
      Spikelets 1 to 1.5 mm. thick........................5. **C. ferax** Rich.
    Rachis not breaking up into joints.
      Spikelets usually containing 5 to 10 achenes.
        Spikelets stout, 1.5 to 2 mm. thick, yellowish. 6. **C. panamensis** (Clarke) Britton.
        Spikelets almost filiform, green...........7. **C. caracasanus** Kunth.
      Spikelets with only 1 to 4 achenes.
        Rays of the umbel compound, with clusters of spikes at their ends.
          Plants pale green; spikes over 10 mm. in diameter, very dense, reddish....................................8. **C. ligularis** L.
          Plants bright green; spikes 8 mm. or less in diameter, lax, green or yellowish..................9. **C. incompletus** (Jacq.) Link.
        Rays of the umbel simple, with a single spike at the end.
          Spikes very short, subglobose............10. **C. globulosus** Aubl.
          Spikes elongate, cylindric.
            Spikes very dense, the spikelets ascending, turgid. 11. **C. cayennensis** (Lam.) Britton.
            Spikes lax, the spikelets divaricate, not turgid. 12. **C. hermaphroditus** (Jacq.) Standl.
  Rachis of the spikelet persistent.
    Spikelets spicate.
      Culms terete or nearly so, naked, usually over a meter high. 13. **C. giganteus** Vahl.
      Culms 3-angled, leafy, at least below, much lower.
        Spikelets purple or chestnut. Plants with rootstocks. 14. **C. rotundus** L.
        Spikelets green and yellowish.
          Scales of the spikelet acute or acuminate; plants with fibrous roots. 15. **C. compressus** L.
          Scales obtuse; plants with rootstocks. 16. **C. sphacelatus** Rottb.

Spikelets digitate or capitate.
  Spikelets crowded into a single dense head, whitish. **17. C. tenerrimus** Presl.
  Spikelets not in a single head.
    Plants annual ---------------------------- **15. C. compressus** L.
    Plants perennial.
      Spikelets ovate, the scales mostly obtuse.
        Spikelets pale yellowish green, in loose heads. **18. C. surinamensis** Rottb.
        Spikelets whitish or pale green, in very dense globose heads. **19. C. luzulae** (L.) Retz.
      Spikelets linear or oblong, several times as long as broad, the scales acute or acuminate.
        Stamen 1; culms shorter than the rays of the umbel. **20. C. simplex** H. B. K.
        Stamens 2 or 3; culms longer than the rays of the umbel.
          Spikelets 2 to 3 mm. wide, green; bracts large and leaflike, numerous ---------------------- **21. C. diffusus** Vahl.
          Spikelets 1 to 2 mm. wide, brownish; bracts 1 or 2, much reduced. **22. C. haspan** L.

Several additional species occur in Panama. *C. articulatus* L. is reported by Kuntze as collected about the zone. *C. elegans* L. also is reported, and Hemsley states that it was collected at Empire by Hayes. *C. esculentus* L. has been collected not far away, and should occur here.

Most of the species listed are common and widely distributed about the zone. *C. fugax* and *C. tenerrimus* have been found only at Bella Vista, and *C. odoratus* about Corozal and Balboa. *C. giganteus* is conspicuous in shallow water about Gatún Lake. In habit and general appearance it is much like the papyrus of the Nile, from which the Egyptians made paper. *C. hayesii* is a species known only from the zone, but it is probably only a form of *C. ferax*.

For *C. diffusus* I was given the name "junquillo"; and for *C. ferax*, *C. caracasanus*, *C. luzulae*, *C. haspan*, and *C. simplex* that of "junco." This is a derivative of the Latin *juncus*, and is applied in Central America to many sedges and rush-like plants ,being a generic or family rather than a specific designation. In Salvador the name "coyolillo'' is given to *C. ferax*, *C. caracasanus*, and other species. On Taboga Island *C. ligularis* is called "cortadera."

3. ELEOCHARIS R. Br. SPIKERUSH

Scales of the spike firm, indurate, scarcely keeled or nerved. Plants perennial, very stout; spikes about as thick as the culm.
  Culms acutely 3-angled above, not septate. **1. E. mutata** (L.) Roem. & Schult.
  Culms terete, septate ---------------------- **2. E. interstincta** (Vahl) R. Br.
Scales thin, soft, keeled or nerved.
  Style 2-cleft; achene lenticular.
    Plants perennial, with rootstocks; spikes elongate; culms 2 to 2.5 mm. thick; achenes brown -------------- **3. E. nodulosa** (Roth) Schult.
    Plants annual, with fibrous roots; spikes subglobose; culms about 1 mm. thick; achenes black --------------- **4. E. caribaea** (Rottb.) Blake.
  Style 3-cleft; achenes 3-angled.
    Culms 3 to 8 mm. thick, septate; spike about as thick as the culm. Tall perennial -------------------------- **5. E. geniculata** (L.) R. Br.

Culms 1.5 mm. thick or less, not septate; spike much thicker than the culm.
  Plants perennial, the culms stiff, erect. Achene smooth.
    6. **E. sulcata** (Roth) Nees.
  Plants annual, the culms filiform, weak.
    Achene cancellate..................7. **E. retroflexa** (Poir.) Urban.
    Achene smooth..........................8. **E. durandii** Boeckel.

No other species are known from Panama. All those listed are common or frequent about the zone. They are easily recognized by their naked culms and solitary spikes. The species with thick culms, known here and in Costa Rica as "junco," are much used in the latter country for plaiting soft mats, which are used upon beds as mattresses. *E. geniculata* is known in Salvador as "tul" and "tule."

4. STENOPHYLLUS Raf.

Spikelets sessile in dense umbellate fascicles; perennial.
  1. **S. junciformis** (H. B. K.) Britton.
Spikelets pediceled, solitary on the rays of the umbel; annual.
  2. **S. tenuifolius** (Rudge) Britton.

One other species is known from Panama. Both the species listed are frequent on the Pacific slope, growing in savannas or on grassy hillsides.

5. FIMBRISTYLIS Vahl

Culm bearing a single compressed spikelet. Plants perennial, densely tufted.
  Style branches 3......................1. **F. monostachya** (L.) Hassk.
Culm bearing several or many terete spikelets.
  Style branches 3. Plants annual.
    Spikelets 2 to 4 mm. long, very obtuse..............2. **F. miliacea** Vahl.
    Spikelets about 6 mm. long, acute........3. **F. complanata** (Retz.) Link.
  Style branches 2.
    Achene longitudinally striate; plants usually annual.
      4. **F. diphylla** (Retz.) Vahl.
    Achene smooth or reticulate, not striate; plants perennial.
      Scales of the spikelets puberulent near apex..5. **F. ferruginea** (L.) Vahl.
      Scales glabrous.
        Leaves much shorter than the culms; inflorescence dense and congested; scales thin, loose, dull..................6. **F. spathacea** Roth.
        Leaves usually as long as the culms; inflorescence open; scales very thick, closely appressed, shining......7. **F. spadicea** (L.) Vahl.

About the zone *F. monostachya* has been found only at Las Sabanas, and *F. complanata* also is rare. *F. ferruginea* and *F. spathacea* have been collected only on the Atlantic coast. The species listed are all that are known from the Republic of Panama.

6. SCIRPUS L.

Scirpus cubensis Kunth, the only Panama species, is occasional in shallow water. It is a coarse perennial with large globose umbellate greenish heads.

7. FUIRENA Rottb.

Inner scales of perianth obovate, scarcely stipitate, scarcely thickened at apex; leaves 1.5 cm. wide or less......................1. **F. umbellata** Rottb.
Inner scales of perianth oval or ovate-lanceolate, conspicuously stipitate, much thickened at apex; leaves 1.5 to 2 cm. wide..........2. **F. robusta** Kunth.

F. umbellata is frequent in swamps. *F. robusta* was collected near Chagres in 1850, but has not been found recently.

8. LIPOCARPHA R. Br.

The only Central American species, *F. maculata* (Michx.) Rich., is frequent in wet places, especially on the savannas beyond Panama City. It is a slender annual, each culm bearing 3 small, ovoid, dark brown heads.

9. MARISCUS Zim. SAWGRASS

The only Central American species, *M. jamaicensis* (Crantz) Britton, was reported from Colón by Hemsley and (as *Hypolytrum kuntzeanum* Boeckel.) by Kuntze. It is a coarse perennial with rough-edged leaves.

10. REMIREA Aubl.

The only species of the genus, *R. maritima* Aubl., is said by Hemsley to have been collected near Chagres by Fendler. It is a perennial seashore plant, with short stiff spreading leaves.

11. DICHROMENA Michx.

Leaves 5 to 12 mm. wide. Plants with rootstocks; bracts green. 1. **D. watsoni** Britton.
Leaves 2 to 4 mm. wide.
  Plants with fibrous roots; bracts subtending the heads of spikelets green throughout ---------------------- 2. **D. radicans** Schlecht & Cham.
  Plants with rootstocks; bracts white within near the base -- 3. **D. ciliata** Vahl.

These are the only Central American species. In the zone *D. watsoni* is known only from the hills near Frijoles, but the others are common. For *D. ciliata* I was given the name "junco menudo," a term of little significance, and the name "clavo" also is applied to the plants.

12. RYNCHOSPORA Vahl. BEAK-SEDGE

Spikelets all crowded into a single dense head. Perennials.
  Bracts subtending the head 10 to 30 cm. long; leaves 8 to 15 mm. wide; spikelets green ---------------------------------- 1. **R. cephalotes** (L.) Vahl.
  Bracts 4 cm. long or less; leaves 3 mm. wide or narrower; spikelets brownish or yellowish.
    Plants glabrous; bracts not ciliate; scales indurate. 2. **R. globosa** (H. B. K.) Roem. & Schult.
    Plants more or less pubescent; bracts ciliate; scales thin.
      Bracts in part leaflike and much longer than the head; outer spikelets reflexed or spreading ---------------- 3. **R. barbata** (Vahl) Kunth.
      Bracts all thin and scarious, about as long as the head; spikelets all erect. 4. **R. armerioides** Presl.
Spikelets variously arranged but not in a single head.
  Spikelets in globose heads. Perennial ---- 5. **R. cyperoides** (Swartz) Mart.
  Spikelets not in heads.
    Branches of the style short or none, much shorter than the undivided portion; plants perennial, coarse, usually a meter high or more. 6. **R. corymbosa** (L.) Britton.
    Branches of the style equaling or longer than the undivided portion; plants annual, slender, seldom more than 30 cm. high.
      Achenes smooth ------------------------------------ 7. **R. clarkei** Rose.

Achenes transversely rugose.
  Spikelets minute, 1 to 1.5 mm. long..........8. **R. micrantha** Vahl.
  Spikelets 3 to 10 mm. long.
    Achenes 1 or 2 in each spikelet, tridentate at apex; spikelets greenish, in few small clusters............9. **R. setacea** (Berg) Boeckel.
    Achenes 3 or more in each spikelet, not tridentate at apex; spikelets dark brown, corymbose.........10. **R. eximia** (Nees) Boeckel.

A few additional species are known from other parts of Panama. The ones listed are mostly rather common about the zone, although several of them have been found only on the savannas beyond Panama City. The name "paja macho de monte" (tapir grass) was given for *R. cephalotes* at the Río Tapia.

13. HYPOLYTRUM L. Rich.

Hypolytrum nicaraguense Liebm., the only Central American species, grows in swamps near the Atlantic coast. It is a coarse plant, often a meter high, with leaves 1.5 to 3 cm. wide. The numerous small brown heads are arranged in a single terminal panicle.

14. SCLERIA Berg

Spikelets not all unisexual, some of the pistillate with staminate flowers. Plants small and very slender, usually hairy; spikelets in elongate, simple or branched, interrupted spikes.
  Achenes smooth; spikelets in a simple spike...........1. **S. hirtella** Swartz.
  Achenes rugose; spikes usually branched............2. **S. liebmanni** Steud.
Spikelets all unisexual.
  Margin of the disk beneath the achene laciniate or ciliate.
    Achenes tuberculate; disk laciniate..............3. **S. panicoides** Kunth.
    Achenes smooth; disk ciliate.
      Achenes about 5 mm. long....................4. **S. paludosa** Kunth.
      Achenes less than 3 mm. long.......................5. **S. mitis** Berg.
  Margin of the disk neither ciliate nor laciniate.
    Achenes tuberculate or reticulate.
      Plants with fibrous roots; achenes glabrous..........6. **S. setacea** Poir.
      Plants with rootstocks; achenes pubescent.........7. **S. bracteata** Cav.
    Achenes smooth.
      Achenes 3 to 4 mm. long; branches of the inflorescence pilose.
        8. **S. secans** (L.) Urban.
      Achenes 2.5 mm. long or less.
        Achenes white...............................9. **S. pterota** Presl.
        Achenes chestnut or purple......10. **S. melaleuca** Schlecht. & Cham.

Several other species occur in Panama. About the zone, *S. hirtella* has been found only on Ancón Hill and *S. liebmanni* only near the Pacific. *S. panicoides* is reported by Hemsley from Empire, collected by Hayes, but it has not been found in recent years. *S. foveolata* Cav., discovered by Née in swamps near Ancón Hill, may be the same species. *S. margaritifera* Cav., described from the same locality, may be *S. arundinacea* Kunth, although that species is not represented in recent collections from the zone. *S. setacea* has been collected only near the Pacific coast. In Salvador it is known as "navajuela." *S. bracteata* was described from specimens collected by Née near Ancón Hill. It is often scandent and 1 to 3 meters high. The rough leaves cut the skin almost like knives, hence the names "cortadera" and "cuchillito" used about the zone, and "navajuela" in Mexico. *S. secans*, very similar in habit, has been collected only on Taboga Island. The name "cortadera" is applied also to *S. pterota* in the zone.

15. CALYPTROCARYA Nees

The only Central American species, *C. glomerulata* (Brongn.) Urban, seems to be widely scattered but is not common. It is a perennial with rootstocks, the small spikelets in axillary corymbs.

8. PHOENICACEAE. Palm Family

Leaves suborbicular, fan-shaped.......................1. **ACANTHORHIZA.**

Leaves pinnately divided, with 2 to numerous segments, or the blades bifid at apex.

Plants armed with long spines.

Plants scandent; terminal portion of the leaf rachis naked, armed with reflexed spines.................................2. **DESMONCUS.**

Plants erect; rachis with segments to the tip, without reflexed spines.

Staminate flowers sunken in pits in the rachis.

Petals of pistillate flowers connate only at base......3. **ACROCOMIA.**

Petals of pistillate flowers connate to far above the base. 4. **ASTROCARYUM.**

Staminate flowers not sunken in the rachis.

Plants large trees with heavy thick trunks; leaf segments not distichous.....................................5. **GUILIELMA.**

Plants usually small and shrublike, with slender trunks; leaf segments distichous.

Fruit broader than long, with soft red pulp; pinnae usually grouped. 6. **BACTRIS.**

Fruit longer than broad, with firm hard flesh; pinnae irregularly spaced..................................7. **PYRENOGLYPHIS.**

Plants unarmed, except sometimes on the petioles.

Fruit ellipsoid, as large as a hen's egg, covered with hard, glossy, tightly overlapping scales...................................8. **RAPHIA.**

Fruit not covered with scales.

Pistillate flowers 5 to 7 cm. long or larger; fruits in age fused into a large head. Trunk short, or long and creeping.....9. **PHYTELEPHAS.**

Pistillate flowers small; fruits not fused.

Fruit covered with large pyramidal tubercles. Trunk short; leaves pinnatisect; spadices several; flowers of both sexes borne on the same spadix.................................10. **MANICARIA.**

Fruit not tuberculate.

Fruit very large, usually over 20 cm. broad...........11. **COCOS.**

Fruit much smaller.

Inflorescences inserted below the leaves.

Spathes 2; plants without prop roots; leaf segments acuminate.

Petals of pistillate flowers connate at base; trunk massive, often swollen or bulging; inflorescence twice branched. 12. **ROYSTONEA.**

Petals free; trunk slender, not swollen; inflorescence once branched.

Fruit globose, the stigmas excentric or lateral; leaf sheath elongate, cylindric; branches of spadix erect-spreading.................................13. **EUTERPE.**

Fruit ovoid, with apical stigmas, or globose with basal stigmas; sheaths short, inflated, open; branches of spadix pendulous...............14. **OENOCARPUS.**

Spathes numerous; plants with large prop roots; leaf segments wedge-shaped........................**15. IRIARTEA.**

Inflorescences inserted among the living leaves.

Plants small, slender, the leaves usually 1 to 2 meters long; trunk very slender or none.

Flowers not immersed in the rachis.

Flowers dioecious, those of the two sexes on separate plants.....................**16. CHAMAEDOREA.**

Flowers monoecious, those of both sexes together in rows on the same spadix..........**17. SYNECHANTHUS.**

Flowers immersed in the rachis.

Inflorescence branched................**18. GEONOMA.**

Inflorescence simple.

Anther cells distinct, pendulous....**19. ASTEROGYNE.**

Anthers sagittate.............**20. CALYPTROGYNE.**

Plants large, the leaves several meters long; trunk very thick, short or elongate.

Trunk short; petioles long, spiny; inflorescences very short, the fruits in a dense ovoid head...........**21. ELAEIS.**

Trunk tall; petioles very short, unarmed; inflorescences long, the fruits in a cylindrical cluster........**22. ATTALEA.**

Palms are well represented about the Canal Zone as to both species and individuals. Unfortunately, the palms of Central America, and above all those of Panama, are still imperfectly known, and consequently it is impossible to supply here specific names for some of the commonest forms.

About the towns of the zone, particularly in Ancón, many exotic palms have been planted, but no attempt has been made to list these in the present account. The most striking of the cultivated forms are the fishtail palms of the genus *Caryota*, readily recognized by their twice pinnatisect leaves with broad wedge-shaped segments.

The writer is under obligations to Mr. O. F. Cook for advice in the preparation of this enumeration of the Canal Zone palms.

1. **ACANTHORHIZA** Wendl.

A. warscewiczii Wendl., of occasional occurrence in the dense wet forests of the Atlantic slope, was described from Chiriquí, and is known also from Darién and the lowlands of Costa Rica. It is a tall palm with stout trunk covered with long slender dark spines. The large fan-shaped leaves, pale beneath and split in the middle to the base, are distinctive. The slender petioles are 2 meters long, unarmed, with large bunches of woollike fibers at the base, the globose fruits less than 1 cm. in diameter. This species is known locally as "palma de escoba" and "nolf." The leaves are employed for thatching and for coarse brooms, and the wool is used for stuffing cushions.

It is probably this palm that was reported from Panama by Seemann as *Thrinax argentea* Lodd.

2. **DESMONCUS** Mart.

A species tentatively referred to *D. polyacanthos* Mart. is frequent in the forests of both slopes, being known here as "matamba." It is a large vine, the slender stems as well as the leaves and spathes armed with numerous slender blackish needlelike spines. The leaves have numerous pinnae which are lanceolate, entire, and long-acuminate. In the upper part of the rachis the leaflets are replaced by stout, abruptly recurved spines. The oblong fruits, about 1.5 cm. long, are borne in ample panicles. The plant is a very annoying one in the forests, since the spines of the leaves catch hold of clothing, and penetrate the flesh readily.

3. ACROCOMIA Mart. WINEPALM

Acromia sclerocarpa Mart. is frequent here, at least on the Pacific slope, growing in open places. The forms of this genus growing from Costa Rica to Mexico and named *A. vinifera* Oerst. and *A. mexicana* Karw. are probably referable to the same species. This is a palm with a thick, usually tall trunk densely armed with long dark spines. The large elongate leaves, with many narrow acuminate segments, also are spiny on the rachis and on the costa of the segments. The inflorescences are large, pendent, and spiny, the fruit large, globose, smooth, and black at maturity.

In many places along the Pacific coast of Central America this palm forms extensive forests. Everywhere it is known as "coyol," and in Panama it is sometimes called "palma de vino." The sweet sap extracted from the trunk is of agreeable flavor, and a fermented drink is frequently made from it at the present time in Panama. The seeds are eaten by cattle, and are said to have served as human food.

4. ASTROCARYUM Mey.

There are two species of this genus occurring on the Atlantic slope, one of them probably *A. polystachyum* Wendl., which was discovered first in Costa Rica. They have short, very spiny trunks, and long pinnatisect leaves with numerous narrow segments which are acuminate at apex or obliquely truncate. The segments are usually whitish beneath and often have spiny margins. The inflorescences are once branched, the flowers densely crowded, the fruit large, ovoid or globose, smooth or spiny. One of these palms is called "pina-pina" in Panama. In Costa Rica *D. polystachyum* is known as "coyolillo." The black palm of Panama is a species of *Astrocaryum*, whose extremely hard, very black wood is utilized for making canes offered to the tourists. The wood has been suggested as suitable for the manufacture of handles for golf clubs and umbrellas.

5. GUILIELMA Mart. PEJIBAYE

The only Central American species, *G. utilis* Oerst., is planted occasionally in the region and may be native. It is one of the best-known palms of Costa Rica, where it is much planted for its fruit. The trunk is very tall, often 8 meters or more, and distinctive in having alternating, light and dark bands of spines. The fruits, borne in large pendent bunches and red or yellow at maturity, ripen in midwinter and are much prized by the native people. The thick flesh of the fruit, when boiled, is mealy and sweet, suggesting boiled sweet potatoes or chestnuts. The very hard wood was much used by the Indians for bows, arrows, clubs, and other articles. The name pejibaye has numerous variant spellings.

6. BACTRIS Jacq.

Petiole and rachis whitish-tomentose, armed throughout with long stout pale spikes; leaf segments, when dry, disarticulating near the base. **1. B. minor** Jacq.

Petiole and rachis not tomentose, the petiole spiny only near the base with slender dark spines, the rachis usually unarmed................**2. B.** sp.

The plants are small erect palms with comparatively slender stems, usually in clumps, and armed with long slender spines. The leaves are terminal or scattered along the stems, cleft into few or many narrow segments. The spadices are small and branched, subtended by 2 hard spiny spathes, the fruits 2 cm. long or smaller, each containing a single seed.

B. minor seems to be confined to the Pacific watershed, where it is common. It is known as "uvito," "caña brava," "caña brava blanca," and "corocillo." The second species, not yet identified but belonging to the section or genus *Trichobactris*, grows on the Atlantic slope.

The species of *Bactris* are common in the lowlands of many parts of Central America. Often they form dense thickets nearly or quite impenetrable because of the dense armament of spines. The hard seeds are eaten sometimes, but they are not very palatable. The Aztec name "huiscoyol" is used for the plants in many regions.

7. **PYRENOGLYPHIS** Karst.

A single species grows here, *P. major* (Jacq.) Karst. (*Bactris major*, Jacq.), frequent in the forests of both slopes. In habit it is much like the species of *Bactris*, but larger in all its parts, the fruits being about 5 cm. long. This palm is known as "lata," "palma brava," and "palma brava morada." The acidulous flesh of the black or purplish fruit is sometimes eaten.

8. **RAPHIA** Beauv.

The single American species, *R. vinifera* Beauv., is said to grow in some places on the Atlantic slope. It is reported to range from Brazil to Nicaragua, besides occurring in Africa. The plant has a short trunk, rarely 3 meters high, and very long, erect-spreading, pinnatisect leaves, the pinnae regularly spaced and usually spiny-margined. The recurved inflorescences are very large and woody, persisting and producing fruits for several years. This palm is said to be called "holillo" in Nicaragua.

9. **PHYTELEPHAS** Ruiz & Pav. IVORY PALM

An ivory palm, *P. seemanni* Cook, occurs in wet forest about the head of Gatún Lake. The plant has a thick trunk which is erect or prostrate and rooting along the ground. The erect leaves are often 6 meters long, with about 100 narrow segments. The plants are dioecious, the staminate inflorescence a simple fleshy spadix 30 to 60 cm. long, densely covered with whitish flowers, pendent and often resting upon the ground. The fruit, consisting of 6 or 7 fused drupes, is a cluster as large as a man's head, erect at first but drooping at maturity. The drupes are covered with hard woody protuberances, and each contains several large seeds, usually 6 or 7.

The seeds are filled at first with a watery liquid, but this later becomes milky and finally almost as hard as ivory. The seeds of the various species of ivory palms are exported in large quantities from Panama and South America, and the kernels are employed as a substitute for ivory, a great variety of articles being fashioned from them. The leaves are used sometimes for thatching.

In Panama as well as Colombia the ivory palms are called "tagua" or "palma de marfil"; their fruits "cabeza de negro," and the seeds "marfil vegetal."

Several additional species of *Phytelephas* have been described from the Republic of Panama by Cook.[13]

10. **MANICARIA** Gaertn.

The only North American species, *M. saccifera* Gaertn., is abundant in some of the swamps near the Atlantic coast, where it often forms continuous stands which are very dense and of distinctive appearance. The plants are often 6 meters high or more, but the trunk is frequently short. The numerous erect

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[13] Journ. Washington Acad. Sci. 3: 138–143. 1913.

or ascending leaves are as much as 5 meters long, and irregularly pinnatisect, the segments lacerate at apex. The branched inflorescences are about a meter long, with 2 spathes, the inner a tough fibrous sac. The flowers are inserted in pits in the rachis. The fruit is distinctive, being globose, 4 to 5 cm. in diameter, usually 2 or 3-seeded, and covered with numerous thick, irregularly pyramidal tubercles.

This palm is said to be known here as "guágara" and "cabeza de negro." In Guatemala it is called "confra" and "yolillo." It is common along the Atlantic coast of Central America, and the leaves are much used for thatching, it being said that roofs made from them will last 40 or 50 years. Pigs eat the fruits. The brown feltlike spathes, composed of tough interlacing fibers, form a conic covering for the inflorescence, and are slow in separating. In this form they are used for making long caps, which are one of the common articles offered for sale in the curio shops of Panama.

In Brazil this species is said to have sometimes a trunk as much as 6 meters high. The form occurring in Panama and northeastern South America has been treated by some authors as a distinct species or variety, *Manicaria plukenetii* Griseb. & Wendl., or *M. sacciferra* var. *plukenetii* Griseb. & Wendl.

11. **COCOS** L.

The coconut, *Cocos nucifera* L., is plentiful nearly everywhere about the inhabited portions of the zone, having been planted in almost every clearing for its fruits. It is most abundant along the seashores, where the slender trunks with their graceful crowns of leaves form a conspicuous feature of the landscape. The tree is much planted for ornament.

In Central America coconuts are esteemed chiefly for the "milk" or sweet liquid which fills the full-grown but immature fruits. This is always cool, no matter how hot the atmosphere, and furnishes a satisfying beverage in regions where too often the available water must be looked upon with suspicion. The tender meat in this unripe stage is good to eat, and may be scooped out with a spoon. The meat of ripe coconuts is rarely eaten in Central America, but it is used for making candies. The growing of coconuts upon a commercial scale seems not to have succeeded in this region, or perhaps it has not been attempted seriously.

The Spanish name for coconut is "coco"; for the tree "cocotero"; and the fruits ready for drinking usually are called "pipas."

12. **ROYSTONEA** Cook. ROYAL PALM

Fruit ovoid, about as broad as long; sheaths with brown scales; leaves drooping -- 1. **R. regia** (H. B. K.) Cook.
Fruit obovoid-oblong, longer than broad; sheaths naked; leaves horizontal -- 2. **R. oleracea** (Mart.) Cook.

The royal palms are among the handsomest of American palms, and are planted for ornament everywhere in the tropics. They have smooth, greenish or whitish trunks 10 to 20 meters high, which are usually slightly swollen. The long graceful leaves are cut into numerous segments. The large twice-branched panicles are pendent, the fruit purplish and about 1 cm. long.

Both the species listed are planted commonly about the zone, the two often together, and the plants show some tendency to become naturalized. ***R. regia*** (*Oreodoxa regia* H. B. K.) is a native of Florida and Cuba, and ***R. oleracea*** (*Oreodoxa oleracea* Mart.) of Barbados.

In Panama as well as elsewhere in Central America these species are called "palma real."

13. **EUTERPE** Gaertn.

A species of this genus, not yet determined, is reported to grow in forests near Frijoles. The species of *Euterpe* are tall slender unarmed solitary palms with a terminal cluster of pinnatisect leaves, their segments narrow and acuminate. The inflorescence is paniculately branched, the fruit very small and 1-seeded.

14. **OENOCARPUS** Mart.

A species referred tentatively to this genus has been collected on the Atlantic slope. It is a tall unarmed palm, growing in clumps, the large leaves pinnatisect, with numerous narrow acuminate several-nerved segments. The small flowers are borne in once-branched panicles, the branches slender and pendent. There are 2 woody caducous spathes. The name "maquenque" is reported as applied to this palm.

15. **IRIARTEA** Ruiz & Pav. STILTPALM

One species of this genus, referred by Seemann to *Iriartea exorrhiza* Mart., is frequent in the virgin forests of the Atlantic slope, where it is called "jira." The species is reported to range from Costa Rica to Brazil, but the forms have not been studied critically.

This is one of our handsomest palms, having a smooth green trunk 3 to 6 meters high or higher, with a crown of few long leaves having numerous somewhat wedge-shaped, irregularly toothed divisions. The sheaths of the leaves form a large bulge at the top of the trunk, and below this hang the few branched inflorescences. The dark green, oval fruits are about 3 cm. long.

One of the most conspicuous features of the tree is found in the numerous thick prop roots which brace the trunk firmly. The bark of these roots is covered with short thick sharp-pointed spinelike protuberances, and pieces of the roots are used sometimes as graters, for grating coconut meat, etc.

16. **CHAMAEDOREA** Willd.

One species of this genus, *C. wendlandiana* (Oerst.) Hemsl., is frequent in the wet forests of the Atlantic slope. It is a very handsome small palm, 1.5 to 3 meters high, with slender reedlike green stems, the leaves, scattered along the upper portion of the stem, having few broad or narrow, thin segments. The inflorescences are small and once branched, the staminate flowers dense and whitish. The ellipsoid fruit, like the rachis, is colored bright orange. The plant is known here as "caña verde" and "bolá"; elsewhere in Panama it is called "bodá" and "ñurú". It is the "palmito dulce" of Costa Rica.

There are many species of *Chamaedorea* in Central America, and they are plentiful in nearly all the wet or moist forests from the coast up to the limit of trees on the high mountains. Because of their dwarf habit, green stems, and graceful thin foliage, they are perhaps the most attractive of Central American palms. In northern Central America the tender spadices are highly esteemed as a vegetable, being dipped in beaten eggs and fried. So treated they form a delicious dish, having a slightly bitter but agreeable flavor. The spadix is enclosed by green spathes, the whole resembling a reduced ear of corn.

The Chamaedoreas are much planted throughout Central America for ornament and utility. The name "pacaya" is given to them in most regions.

17. **SYNECHANTHUS** Wendl.

S. warscewiczianus Wendl. is frequent in the wet forests of the Atlantic slope. It is a small palm with slender smooth canelike stems 2 to 3 meters high, the few broad leaves with few or numerous, narrow or broad, many-nerved segments. The inflorescence is branched and broomlike, the branches very numerous and dense, slender and straight. The oval orange berries are about 1 cm. long. In Panama this species is called "palmilla" and "bolá".

18. **GEONOMA** Willd.

This genus is represented in the Atlantic forests by two species, neither of which has been determined. The plants have slender smooth trunks 2 to 3 meters high, with a cluster of long pinnatisect leaves. The inflorescences are much branched, the flowers sunken in the branches. The fruit is a small globose berry. In one of the species represented here the branches of the panicle are about 1 cm. thick, while in the other they are only half as stout. One of the species is known on the San Blas coast as "cortadera".

19. **ASTEROGYNE** Wendl.

A species of this genus, perhaps the plant described as *Geonoma cuneata* Wendl., is common in the forests of the Atlantic slope. It is a small palm, stemless or with a trunk a meter high, the leaves crowded at the apex, wedge-shaped, bifurcate at apex, and either entire or irregularly pinnatisect. The inflorescences are simple, terete, 20 to 30 cm. long, long-stalked, the flowers deeply sunken in the axis. The name applied here to this species is "rabo ahorcado", while the name "hoja de gallo" is said to be given in Colombia to the same or a similar plant. The leaves are sometimes used for thatching.

20. **CALYPTROGYNE** Wendl.

A palm of an undetermined species but apparently referable to this genus is common in the Atlantic forests. It is a comparatively small plant, stemless or with a very short trunk, the leaves about 2 meters long and cleft into numerous linear segments. The long-stalked inflorescences are simple and cylindric, 30 to 40 cm. long, dark red, the flowers deeply sunken in the rachis. The globose berries are about 6 mm. long.

21. **ELAEIS** Jacq. OILPALM

The only Central American species, *E. melanococca* Gaertn., is one of the common palms of the region. It grows usually in wet or swampy forest, but often may be found in clearings. The trunk is usually short, only 1 to 2 meters high, but appearing thick because of the persistent sheaths; often it is decumbent or creeping. The numerous leaves are densely crowded, usually 4 to 6 meters long, with very numerous narrow acuminate segments. The almost conelike inflorescences are very dense and much branched, almost hidden among the leaf bases, the fruits small and ovoid, usually distorted by pressure, and red at maturity.

The seeds are reported to be rich in oil, like those of the African oilpalm, *E. guineensis* L., but little or no use is made of them. The local names are "corozo colorado" and "corocito colorado." In Costa Rica the species is known as "coquito" and "palmiche."

22. ATTALEA H. B. K. Corozo

Attalea gomphococca Mart. (pl. 6) is one of the largest and most common palms of the Atlantic slope of southern Central America. The trunk is thick and often short, but it sometimes attains a great height. It is covered by the persistent leaf bases. The leaves form a heavy but graceful crown, being recurved and having very numerous narrow segments. They are the largest leaves produced by any of our palms, being sometimes 10 meters long and over 2 meters wide. The drooping inflorescences are 1.5 to 2 meters long, and when in fruit very dense and heavy. The fruit resembles a small coconut, being about 7 cm. long, mamillate at apex, and subtended by the enlarged perianth.

The seeds of the Attaleas are rich in oil, and are sufficiently abundant to be of economic importance, were it not for the fact that they are so hard that so far it has not been possible to devise a satisfactory machine for crushing them. In western Mexico some oil has been extracted from the seeds and used for making soap, candles, machine oil, etc. The trunks are often used for construction purposes, and the huge leaves for thatching. Palm wine is sometimes extracted from the trunks. The segments of the young leaves are employed for making hats.

In Panama, as well as in most other parts of Central America, the Attaleas are called "corozo," and it is presumably from this tree that Corozal (meaning a corozo grove) takes its name. The names "corozo gallinazo" and "palma real" also are used here. Other names are "coquito" (Mexico), "cohune" (Honduras, Guatemala), and "manaca" (Guatemala, Honduras).

9. CYCLANTHACEAE. Cyclanthus Family

Flowers arranged in rings upon a spadix, the rings alternately staminate and pistillate; leaves 2-parted, the 2 divisions long and strap-shaped. **1. CYCLANTHUS.**

Flowers not in rings, the staminate in clusters of 4 around a solitary pistillate flower; leaves 4-parted, the segments many-cleft above. **2. CARLUDOVICA.**

1. CYCLANTHUS Poit.

The only Central American species, *C. bipartitus* Poit. (pl. 7), is common in forests about the zone, especially along streams. The plants are acaulescent, and usually form dense clumps 1 to 3 meters high. The petioles are long and reedlike, and the leaf blade with its two long narrow segments is unlike that of any other local plant. The name "portorrico" is given to the plant here, while in Costa Rica, it is said to be known, as "hoja de lapa."

2. CARLUDOVICA Ruiz & Pav.

The Panama hatpalm, *C. palmata* Ruiz & Pav. (pl. 8), is one of the abundant and conspicuous plants of the forests. In general appearance it much resembles some true palms, the stemless plants forming great clumps, the slender petioles 1 to 3 meters high. The leaf blades are large in proportion, and their form, like that of a Maltese cross, makes the plant easily recognized. It is a very ornamental plant, and thrives in cultivation. The spadices when in flower are hidden under a mass of very long, entangled, creamy white filaments.

From the young leaves of this plant is obtained the fine strong fiber from which the so-called "Panama" hats are made. These hats are manufactured in a limited part of Ecuador, and are known in Panama only as imported. Although the industry is so restricted, the hatpalm is widely distributed in South America, and extends northward along the Atlantic coast to Guatemala.

About the zone the usual names for the hatpalm are "jipijapa" and "portorrico," but it is known also as "palmita" and "atadero," and it is said that in the *interior* it is called "guachibán." In Costa Rica it is known also as "chidra," and in Guatemala as "palmilla."

Several other species of *Carludovica* have been found in Panama, but they are scandent plants with bifurcate leaves. In Honduras the stems of species of this type are much used for making rattan furniture.

10. ARACEAE. Arum Family

Plants floating on water; leaves arranged in a rosette, spongy..1. **PISTIA.**
Plants epiphytic or terrestrial; leaves not forming a rosette, not spongy.
  Leaf one, several times divided into very numerous segments. Terrestrial; flowers without perianth........................2. **DRACONTIUM.**
  Leaves more than one, entire or lobed or once parted into few segments.
    Leaves peltate. Terrestrial; leaves spotted with pink and white. 3. **CALADIUM.**
    Leaves not peltate.
      Leaves perforated with large holes. Large epiphytic vines; flowers perfect. 4. **MONSTERA.**
      Leaves not perforated.
        Flowers with a perianth.
          Ovary 3 or 4-celled; spathe broad, erect, persistent. Terrestrial, acaulescent; leaves entire, acute at base.5. **SPATHIPHYLLUM.**
          Ovary 1 or 2-celled; spathe narrow, usually recurved, often deciduous. Terrestrial or more often epiphytic, acaulescent or with elongate stems; leaves entire or divided..........6. **ANTHURIUM.**
        Flowers without a perianth.
          Flowers perfect. Epiphytic vines.
            Ovary 2-celled. Leaves lance-oblong, 15 to 18 cm. long; spadix 3 to 4 cm. long................7. **STENOSPERMATION.**
            Ovary with usually 3 to 6 cells. Leaves oblong-ovate, very large; spadix about 18 cm. long..................8. **ANEPSIAS.**
          Flowers monoecious, the pistillate on the lower part of the spadix, the staminate above.
            Stamens connate or coherent.
              Plants epiphytic vines. Ovule one in each cell; leaves 5 or 7-parted.............................9. **SYNGONIUM.**
              Plants terrestrial.
                Ovule one in each cell; plants with erect stems; leaves entire, acute to shallowly cordate at base. 10. **DIEFFENBACHIA.**
                Ovules more than one in each cell; plants acaulescent; leaves entire and deeply cordate, or 5 to 13-parted. 11. **XANTHOSOMA.**
            Stamens distinct.
              Plants with erect stems, terrestrial; leaves hastate, entire, with acute basal lobes...............12. **MONTRICHARDIA.**
              Plants acaulescent or with climbing stems, epiphytic except in one species, entire or lobed or parted, never with acute basal lobes.......................13. **PHILODENDRON.**

Typical cultivated plants of this family are the calla (*Zantedeschia aethiopica* Spreng.) and the caladium or elephant-ear (*Colocasia*). The members of the family are nearly always glabrous, and most of those in Panama are epiphytes.

The leaves are petioled and entire or variously lobed or parted. The simple peduncles bear a single inflorescence, which consists of a green or colored, leaflike spathe, and a spike or spadix upon which the numerous flowers are inserted. hTe whole inflorescence with its many flowers is taken popularly for a single flower. The fruits are small berries.

Plants of the family are abundant and conspicuous about the zone, especially the epiphytic species, which often climb high upon the trees. The juvenile plants often have strikingly handsome leaves. Most of the plants found are sterile, and their leaves are frequently very different from those of mature plants.

In all or most of the plants of the family the watery sap contains needlelike crystals which penetrate the tongue if a piece of the leaf is chewed, causing swelling and intense inflammation and pain.

1. **PISTIA** L. WATERLETTUCE

The only species of the genus, *P. stratiotes* L., widely distributed in tropical regions, in general appearance is quite unlike other members of the family. The plant consists of a rosette of spongy obovate leaves 3 to 10 cm. long, with a mass of fibrous roots, and floats upon the surface of quiet water. In Gatún Lake, as well as elsewhere, it is abundant and often covers solidly large areas of water. No name was obtained for the plant about the zone, but in Salvador it is known as "lechuga de agua" (water lettuce), "lechuga de sapo," "repollo de agua" (water cabbage), and "verdolaga de agua"; in Mexico as "lechuguilla de agua"; and in Cuba and Porto Rico as "lechuguilla" and "lechuga cimarrona."

2. **DRACONTIUM** L.

A sterile specimen of this genus was collected in the zone by Pittier. The plants are terrestrial, each tuber producing a single leaf with a large, much divided blade.

3. **CALADIUM** Vent.

The only Central American species is *C. bicolor* (Ait.) Vent., easily recognized by its peltate heart-shaped leaves, handsomely spotted with red and white. It is frequently planted for ornament and in some localities, such as Mount Hope Cemetery, is thoroughly naturalized. It is often seen in hothouses in the United States. In Panama it is called "corazón de Jesús," and by the West Indians "wild coco." In Guatemala the name "corazón sangrienta" is supplied to it.

The plant grown in the United States under the names "caladium" and "elephant-ear" does not belong to this genus, but is *Colocasia antiquorum* Schott, a native of the Old World. It is often planted in Central America, and is in cultivation in Panama.

4. **MONSTERA** Adans.

Leaves pinnatifid, not perforated.................... 1. **M. dilacerata** Koch.
Leaves perforated.
  Perforations of the leaf blade in 2 to 4 series along the costa.
    2. **M. friedrichsthalii** Schott.
  Perforations irregularly scattered.............. 3. **M. pertusa** (L.) de Vriese.

The local members of this genus are recognized by their broad, pinnatifid or perforated leaf blades. They are large epiphytic vines with long-petioled leaves, and long sessile fruit spikes which are inclosed in the spathe. It is doubtful whether the second and third species listed do not represent varying forms of a single species. For *M. friedrichsthalii* I was given the names "hierba de puerco" and "pasmo," while in Salvador the plant is known as "piña anona" and "pico de zope." *M. dilacerata* has been collected here only on Barro Colorado Island, but the other species are common.

Some and probably all the species of *Monstera* have edible fruits, to which the name "piñanona" is given. The fruits are watery and sweet, but care must be taken in eating them because of the calcium oxalate crystals, which, even when the fruit is thoroughly ripe, are likely to cause inflammation of the tongue. One other species of *Monstera* has been collected in Chiriquí.

5. SPATHIPHYLLUM Schott

Style not exceeding the perianth, the fruiting spikes not tuberculate; leaves lanceolate; spathe not united with the stalk of the spadix.
1. **S. patini** (Hogg) N. E. Brown.
Style elongate, exceeding the perianth, the fruiting spikes appearing tuberculate; leaves oblong to elliptic; spathe partially united with the stalk of the spadix.
  Cells of ovary containing 4 to 8 ovules.........2. **S. friedrichsthalii** Schott.
  Cells of ovary containing 2 ovules.............3. **S. phryniifolium** Schott.

The species are acaulescent terrestrial plants with thin green acuminate leaves. The long scape bears a dense spike, subtended by a large, flat, green or whitish spathe. The type of *S. phryniifolium* was collected at Chagres, but the species has not been collected recently in this region. In Salvador, where this species is known as "huisnay," the tender young inflorescences are cooked with eggs and eaten.

6. ANTHURIUM Schott

Leaves pedately parted. Plants large, scandent, epiphytic.
  Leaf segments entire; spadix thick, conelike.........1. **A. aemulum** Schott.
  Leaf segments lobed or undulate; spadix slender-cylindric, 40 to 50 cm. long.................................2. **A. holtonianum** Schott.
Leaves entire.
  Leaves cordate at base, sagittate.
    Leaves coriaceous..............................3. **A. denudatum** Engler.
    Leaves thin....................................4. **A. triangulum** Engler.
  Leaves acute or obtuse at base.
    Leaves not 3-nerved, the lateral nerves extending to the margin.
      Node of the petiole not keeled dorsally.
        Upper joint of the petiole about as broad as long.
5. **A. tetragonum** (Hook.) Schott.
        Upper joint of the petiole longer than broad.
6. **A. schlechtendalii** Kunth.
      Node of the petiole 1 to 5-keeled dorsally.
        Leaf blades 10 to 13 cm. wide...............7. **A. agnatum** Schott.
        Leaf blades usually 25 to 60 cm. wide.
          Node of the petiole 3-keeled....8. **A. crassinervium** (Jacq.) Schott.
          Node of the petiole 5-keeled........9. **A. maximum** (Desf.) Engler.
    Leaves 3-nerved, the lateral nerves uniting to form a thick nerve near the margin.
      Leaves linear or linear-lanceolate, 5 cm. wide or less.
        Leaves thick, dark green above, paler beneath, the nerves prominulous beneath..........................10. **A. linearifolium** Engler.
        Leaves thin or subcoriaceous, concolorous, the nerves prominent on both surfaces.
          Leaves linear, mostly 1.5 to 2.5 cm. wide.
11. **A. friedrichsthalii** Schott.
          Leaves linear-lanceolate, about 5 cm. wide.
12. **A. scolopendrinum** (Ham.) Kunth.

Leaves oblong-elliptic to elliptic, mostly 6 to 10 cm. wide or wider.
  Cells of ovary 1-ovuled; plants with short thick erect stems; spadix about 3 cm. long .... 13. **A. rigidulum** Schott.
  Cells of ovary 1-ovuled; plants usually acaulescent; spadix much longer.
    Leaves 15 to 23 cm. wide, very thick .... 14. **A. hacumense** Engler.
    Leaves mostly 6 to 14 cm. wide, thinner.
      Leaves usually 30 to 40 cm. long .... 15. **A. acutangulum** Engler.
      Leaves 20 cm. long or less .... 16. **A. littorale** Engler.

Several other species have been collected in Panama. The species are mostly epiphytic. Some have elongate climbing stems, while others are acaulescent. In several species the leaves are very handsome. *A. holtonianum* is a striking plant with leaves a meter broad or more. The genus is a large one in Central America, over 60 species being known from the region, most of them Costa Rican.

7. STENOSPERMATION Schott

Stenospermation sessile Engler is an epiphytic vine with rather thick, finely nerved, lance-oblong leaves 15 to 18 cm. long. The spadix is 3 to 4 cm. long, blunt, and subtended by a deciduous oblong spathe. One other species, *S. spruceanum* Schott, has been collected in Darién.

8. ANEPSIAS Schott

The single species of the genus, *A. moritzianus* Schott, is a large vine with very large, oblong-ovate leaves, rounded at base. The fruiting spike is about 18 cm. long. The plant has been collected in forests about Gatún Lake.

9. SYNGONIUM Schott

Syngonium podophyllum Schott is a common epiphytic vine, easily recognized by the leaves, which in the adult form are cleft into 5 or 7 segments. The spathes are 10 cm. long or less, green, and infold the spadix. The name "azota cabeza" was given for the plant in the Canal Zone, and in Guatemala the name "piñuela" is said to be applied to it.

10. DIEFFENBACHIA Schott. DUMB-CANE

Sheath of the petiole extending nearly to the base of the leaf blade.
  1 **D. pittieri** Engl. & Krause.
Sheath ending far below the base of the leaf blade.
  Spathes green, about 30 cm. long .... 2. **D. longispatha** Engl. & Krause.
  Spathes orange at maturity, usually less than 20 cm. long.
    Leaves rounded at base, oblong-ovate .... 3. **D. oerstedii** Schott.
    Leaves cordate at base, oblong .... 4. **D. aurantiaca** Engler.

The species are closely related, and it is doubtful whether all those listed are really distinct. They are terrestrial plants, about a meter high, with large thick green stems which are usually prostrate and rooting for some distance along the ground. The leaves are mostly oblong or ovate, thick, and acute or acuminate. The spathes are produced in the axils of the leaves, and inclose the fruiting spikes. The berries are scarlet at maturity. Sometimes the leaves are blotched with creamy white, these forms being often seen in cultivation.

The plants when cut give off a strong offensive skunklike odor. The juice is said to be very irritating when in contact with the skin and to cause serious inflammation. About the zone the plants are given the name "otó de lagarto," and the West Indians call them "dumb-cane," a name applied in the West

Indies to *D. seguina* (L.) Schott, a species occurring in some parts of Central America and known in Salvador as "cuyanigua." The species of *Dieffenbachia* are sometimes grown in hothouses in the United States, and the name "mother-in-law plant" is given to them. It is reported that chewing a bit of the leaf causes temporary paralysis of the tongue, and it is probable that such a test would at least result in such swelling of the tongue that it would be for the time useless.

11. **XANTHOSOMA** Schott

Leaves parted into 5 to 13 segments___**1. X. helleboriifolium** (Jacq.) Schott.
Leaves entire, sagittate.
  Leaves puberulent_________________________________**2. X. pilosum** Koch.
  Leaves glabrous________________________________**3. X. violaceum** Schott.

The species are terrestrial plants with long-petioled leaves. The spathe is persistent about the fruiting spadix. *X. helleboriifolium* is called "papayuelo." *X. pilosum* has been found in this region only between Gamboa and Cruces. *X. violaceum* is cultivated extensively about the zone for its edible tuberous roots, which are cooked and eaten like potatoes. The plant has also run wild in some localities. It is known here as "otó," and the Jamaicans call it "badu" and "coco." In Salvador the plant is known as "quequeshque" and "quequesque." Other but closely related species of *Xanthosoma* are known in the West Indies by the name "yautía." *X. brasiliense* (Desf.) Engler is known in Porto Rico as "belembe," and is grown for its leaves, which are cooked like spinach.

The dasheen or taro, *Colocasia esculenta* (L.) Schott, is very similar in general appearance and in its uses to the species of *Xanthosoma*, but is easily distinguished by its peltate leaves.

12. **MONTRICHARDIA** Crüger

The only Central American species, *M. arborescens* (L.) Schott (pl. 9), is frequent in swamps near the Atlantic coast. The plants have erect stems 1 to 2.5 meters high, bearing numerous large petioled sagittate leaves with acute basal lobes, a form of leaf not found in any other local representative of the family. The large spathes are greenish yellow and inclose the spadix.

13. **PHILODENDRON** Schott

Leaves lobed or parted.
  Leaves 3-parted into oblong segments_____**1. P. tripartitum** (Jacq.) Schott.
  Leaves pinnatifid.
    Leaf blades triangular-sagittate in outline, lobed nearly to the midrib. **2. P. warscewiczii** Koch.
    Leaf blades rounded or ovate, less deeply lobed___**3. P. radiatum** Schott.
Leaves entire.
  Leaves obtuse to obscurely subcordate at base.
    Leaves broadly ovate.
      Lateral nerves of leaves subequal, none of them much stouter than the others______________________________**4. P. rigidifolium** Krause.
      Lateral nerves unequal, a few of them much stouter than the others. **5. P. coerulescens** Engler.
    Leaves oblong.
      Leaves obtuse at base____________________**6. P. karstenianum** Schott.
      Leaves shallowly cordate at base____________**7. P. wendlandii** Schott.
  Leaves deeply cordate at base.
    Leaves oblong-cordate_____________________**8. P. brevispathum** Schott

Leaves deltoid-cordate or rounded-cordate.
  Plants terrestrial, acaulescent.................**9. P. grandipes** Krause.
  Plants epiphytic, with elongate stems.
    Ovary 5 or 6-celled; leaves mostly 40 to 50 cm. long; style about as wide as the ovary.........................**10. P. panamense** Krause.
    Ovary 3-celled; leaves usually 25 cm. long or less; style much narrower than the ovary.........................**11. P. hoffmannii** Schott.

Most of the species are rather common and widely distributed in the forests. They are usually large epiphytic vines, whose spathes persist and envelop the fruiting spike. *P. grandipes*, *P. rigidifolium*, and *P. brevispathum* are endemic species, being known only from the vicinity of the zone. For *P. radiatum* the names "azota cabeza" and "chaldé" were given; for *P. rigidifolium* "cinchadora," and its leaves are said to be applied as poultices to snake bites. In Salvador *P. radiatum* is known as "hoja de peche," and *P. warscewiczii* as "ocopapayo" and "copapayo."

Other species besides those listed are known from Panama.

11. LEMNACEAE. Duckweed Family

Only one species of the family has been collected thus far in Panama.

1. LEMNA L. DUCKWEED

Lemna cyclostasa (Ell.) Chev. has been found near Juan Díaz. The plant consists of a free-swimming disklike oblong thallus about 2 mm. long, each thallus with a single rootlet. The members of the family are the smallest flowering plants known. They float upon the surface of quiet water, often in large colonies.

12. MAYACACEAE. Mayaca Family

1. MAYACA L.

The only representative of the family in Central America, *M. aubleti* Michx., grows in pools in the savannas beyond Panama City. It is an aquatic plant, with slender stem 4 to 30 cm. long, in general appearance resembling a moss. The flowers are solitary on slender pedicels in the axils of the linear (4 to 6 mm. long) leaves. There are 3 sepals and 3 white obovate petals.

The genus *Xyris*, of the family Xyridaceae, is represented in Panama.

13. ERIOCAULACEAE. Pipewort Family

1. ERIOCAULON L. PIPEWORT

Eriocaulon schiedeanum Koern. has been collected near Juan Franco Race Track. It is a small herb growing in marshes, with a cluster of linear basal leaves, and slender scapes, each terminating in a small globose head of minute flowers.

14. BROMELIACEAE. Pineapple Family

Ovary inferior; leaves with spiny-toothed margins.
  Petals united below. Plants terrestrial; inflorescence paniculate or headlike; leaves coarsely and remotely toothed.................**1. BROMELIA.**
  Petals free.
    Inflorescence headlike, erect; plants terrestrial. Sepals mucronate at apex.
2. ANANAS.

Inflorescence spicate or paniculate; plants epiphytic.
  Sepals mucronate; inflorescence an erect panicle...... **3. AECHMEA.**
  Sepals not mucronate; inflorescence a simple pendent spike. **4. BILLBERGIA.**
Ovary superior; leaves with entire unarmed margins. Plants epiphytic.
  Petals appendaged within; leaved usually 8 to 10 cm. wide. Inflorescence paniculate...... **5. VRIESIA.**
  Petals not appendaged; leaves, except at base, usually much narrower.
    Hairs upon the seeds longer than the capsule and bent before dehiscence. Small plants with soft green leaves; flowers perfect or dioecious. **6. CATOPSIS.**
    Hairs of the seeds shorter than the capsule, straight.
      Petals free; spikes compressed; leaves often grayish and covered with fine scales...... **7. TILLANDSIA.**
      Petals united; spikes not compressed; leaves green. Bracts of the scape red or pink...... **8. GUZMANIA.**

The plants of the pineapple family are mostly epiphytes, and are often referred to erroneously as orchids. Some of them have showy inflorescences quite as handsome as those of most orchids. The corollas are frequently bright blue. The leaves are usually numerous and form a rosette. The flowers, which are regular or nearly so, have 3 sepals, 3 petals, and 6 stamens. The fruit is a berry or capsule, and in the latter case the seeds are usually hairy.

The inflated leaf bases of many species hold water and afford breeding places for mosquitoes and other insects. Besides the genera listed, *Pitcairnia* and *Thecophyllum* are represented in Panama. Aside from the pineapple, the most widely distributed plant of the family is Spanish-moss or "grandfather's moss," *Tillandsia usneoides* L., so abundant in the southeastern United States. This is common in northern Central America, but has not been reported from Panama.

1. BROMELIA L.

Inflorescence a panicle; ovary and fruit tuberculate; bases of leaves not hairy. **1. B. pinguin** L.
Inflorescence headlike; ovary, fruit, and leaf bases covered with long brown hairs. **2. B. karatas** L.

In both species the leaf margins are furnished with large remote sharp-pointed curved teeth, while in our species of *Ananas* the teeth are small and close. *B. pinguin* (pl. 10) is frequent along the Pacific coast. The fruits are ovoid, yellow, about 4 cm. long, and edible but extremely acid. About the zone the plant is known as "piñuela"; in Salvador as "piña de garrobo" and "piña corredora"; at Quiriguá, Guatemala, as "muta"; and in Mexico, where the fruits are often sold in the markets, as "aguama" and "guamara."

B. karatas has been collected at Chepo, and probably grows nearer the zone. The leaves are sometimes 2 meters long, the bracts pink or red. At Chepo the plant is planted for fences, and it is much used elsewhere in Central America for the same purpose. The name used at Chepo is "piro"; in Salvador the names are "motate," "piña de cerco," and "piñuela."

2. ANANAS Adans.

Leaves with fine close teeth for their whole length; bracts coalescent with the fruits to form a large ovoid juicy multiple fruit.... **1. A. sativus** Schult.
Leaves with coarse distant teeth below; bracts much longer than the free fruits. **2. A. magdalenae** (André) Standl.

No other species are known in Central America. *A. sativus*, the pineapple (the Spanish name is "piña"; the English name "pine" is used also) is cultivated here as elsewhere in the lower parts of Central America, and the pineapples of Taboga are highly praised.

Ananas magdalenae (*Aechmea magdalenae* André; pl. 11) is common about the zone, and in forests often forms impenetrable thickets. The long leaves contain a tough fiber of superior quality used in Central America for making rope and twine. The fruit heads are subglobose, 10 to 15 cm. in diameter, bright red throughout, and supported on a long stalk. The acid fruit is eaten either raw or cooked. Locally the plant is called "pita" and "piñuela," and by the Jamaicans "pingwing." In Salvador it is known as "pita floja."

3. **AECHMEA** Ruiz & Pav.

Bracts subtending the flowers tipped with slender stiff spines nearly or quite as long as the blade of the bract........................1. **A. setigera** Mart.
Bracts merely acute or with very short spinose tips.
  Primary bracts at base of panicle spiny-toothed..2. **A. tillandsioides** Baker.
  Primary bracts entire.
    Bracts subtending the flowers not appressed, subulate-tipped; upper part of leaf with minute teeth....................3. **A. pubescens** Baker.
    Bracts closely appressed, merely acute; upper part of leaf with large teeth. 4. **A. dactylina** Baker.

The species are epiphytes with large spine-toothed leaves. The most common is *A. pubescens*, in which the larger bracts of the inflorescence are red or pink and showy. *A. setigera* is noteworthy because of the many needle-like spines of the inflorescence. *A. tillandsioides* has been collected only between Gorgona and Gatún. *A. dactylina*, collected by Fendler near Chagres, has not been found by recent collectors.

4. **BILLBERGIA** Thunb.

The only Central American species, *B. pallidiflora* Liebm., is occasional in forests. It is an epiphyte with spiny-margined leaves, grayish green and blotched with silver like those of *Sansevieria*. The spicate inflorescence is pendent, the ovary densely farinose. Like many other plants of the family, this is infested with savage ants.

5. **VRIESIA** Lindl.

Inflorescence a simple spike.....................1. **V. disticha** (L.) Standl.
Inflorescence a large branched panicle..........2. **V. paniculata** (L.) Mez.

Vriesia disticha, a small plant with showy purple-red bracts, has been collected on the Atlantic slope. *V. paniculata* (*Tillandsia chagresiana* Baker is a synonym) was collected by Fendler near Chagres. This is probably the large bromeliad common on the trees of Mount Hope Cemetery. The entire leaves are often a meter long and as much as 10 cm. wide. The flowers are about 6 cm. long, with whitish petals.

6. **CATOPSIS** Griseb.

Flowers perfect; stamens equal in length; capsules about 20 mm. long. 1. **C. fulgens** Griseb.
Flowers dioecious; stamens unequal; capsules about 10 mm. long. 2. **C. tenella** Mez.

Both species are small epiphytes, 10 to 30 cm. high, with soft broad entire green leaves. *C. fulgens* has been collected only at Las Cascadas Plantation; and *C. tenella* near Fort Sherman and on Barro Colorado Island.

7. TILLANDSIA L.

Spikes 3 to 4 cm. wide, very dense, the bracts large and much imbricate, appressed.
  Spikes one or more, turgid, not strongly compressed; posterior sepals connate to the middle ---------- 1. **T. fasciculata** Swartz.
  Spike one, strongly compressed; posterior sepals free -- 2. **T. compressa** Bert.
Spikes less than 3 cm. wide or, if wider, with remote spreading bracts.
  Flowers and bracts remote, divaricate. Leaves bulbose at base, conspicuously twisted ---------- 3. **T. aloifolia** Hook.
  Flowers and bracts approximate or crowded, appressed or ascending.
    Plants large, about a meter high, the inflorescence of numerous panicled spikes ---------- 4. **T. orthorachis** Mez & Baker.
    Plants small, usually 30 cm. high or less, the inflorescence of 1 to 4 spikes.
      Leaves neither coriaceous nor inflated at base, thin, erect or ascending. 5. **T. digitata** Mez.
      Leaves coriaceous or inflated at base.
        Bracts densely lepidote. Plants with hard bulblike bases. 6. **T. bulbosa** Hook.
        Bracts glabrous.
          Leaves coriaceous at base but not inflated. 7. **T. melanopus** Morren.
          Leaves thin and inflated at base ---------- 8. **T. balbisiana** Schult.

Several other species are known from Panama, and many more from Central America. About the zone the name "cogollos" is given to these plants and others of the family, while in other parts of Central America they are called "gallos," "gallitos," and "chivitos," or very often simply "parásitos," the general term for all epiphytes.

None of the species seem to be very abundant or generally distributed about the zone. *T. compressa* has been collected only between Frijoles and Monte Lirio. *T. aloifolia* is plentiful at Bella Vista and elsewhere, often growing upon manchineel trees. The bulbs of *T. bulbosa* are usually infested with ants which bite severely.

8. GUZMANIA Ruiz & Pav.

Guzmania minor Mez, a frequent epiphyte, is a small plant, usually about 30 cm. high, with many broad thin entire green leaves, much enlarged at base. The inflorescence is a short simple spike, its large bracts bright red or purplish.

15. COMMELINACEAE. Dayflower Family

Flowers inclosed in a compressed spathe or spathes.
  Plants stemless or nearly so; leaves strap-shaped; flower clusters inclosed in 2 spathes; fertile stamens 6 ---------- 1. **RHOEO.**
  Plants with elongate leafy stems; leaves lanceolate or oblong; flower clusters subtended by a single spathe; fertile stamens 2 or 3.
    Fruit indehiscent, crustaceous, white or blue; corolla white. 2. **ATHYROCARPUS.**
    Fruit dehiscent, greenish; corolla blue ---------- 3. **COMMELINA.**
Flowers not inclosed in a spathe, often subtended by bracts, but these not compressed.
  Sepals becoming fleshy and inclosing the capsule. Tall plant with broad leaves; flower clusters subtended by large leaflike bracts ---------- 4. **CAMPELIA.**

Sepals thin, unchanged in age.
  Ovules 3 to 5 in each cell; large erect plants, often a meter high; leaves usually 4 to 7 cm. wide.
    Flowers paniculate; seeds arillate................5. **DICHORISANDRA.**
    Flowers umbellate; seeds not arillate.................6. **POGOMESIA.**
  Ovules 1 or 2 in each cell; plants small, usually decumbent or prostrate; leaves less than 3 cm. wide.
    Ovule 1 in each cell; leaves linear or oblong-linear. 7. **LEPTORRHOEO.**
    Ovules 2 in each cell; leaves oblong-lanceolate to ovate. 8. **TRADESCANTIA.**

The genus *Floscopa* also occurs in Panama. The plants of the family are succulent herbs with alternate entire leaves having basal sheaths. The flowers of the Panama representatives are mostly small and inconspicuous, white, blue, or pink.

1. RHOEO Hance

The only species of the genus is *R. discolor* (L'Hér.) Hance, native of Central America, but in Panama known only in cultivation. It is nearly stemless, with long broad strap-shaped leaves, purplish beneath. The flowers are white and subtended by large purple spathes.

2. ATHYROCARPUS Schlecht.

Spathes axillary, long-pedunculate, their margins free; fruit dark blue. 1. **A. leiocarpus** (Benth.) Benth. & Hook.
Spathes terminal, nearly sessile, their margins united below; fruit whitish.
  Spathes glabrous or nearly so..........2. **A. persicariaefolius** (DC.) Hemsl.
  Spathes rufous-hirsute......................3. **A. rufipes** (Seub.) Standl.

These are the only Central American species. They are ascending herbs with small white flowers, in habit like *Commelina.*

3. COMMELINA L. Dayflower

Margins of the spathe united below..................1. **C. elegans** H. B. K.
Margins of the spathe free..........................2. **C. longicaulis** Jacq.

One other species, *C. monticola* Seub., has been collected in the mountains of Panama. Both the species listed, common about the zone, have blue flowers. Some species of *Commelina* are cultivated in the United States under the name "wandering Jew." For *C. elegans* the name "codillo" (little elbow, in reference to the geniculate stems) was given me. This species is known in Salvador as "coyontura," and in Mexico as "hierba del pollo." For *C. longicaulis* (which has usually been called *C. nudiflora*) the name "verdolaga" was given at the Río Tapia. This name belongs primarily to *Portulaca,* but is frequently applied to other small plants with fleshy leaves.

The name *C. virginica* L. has often been applied to the plant here called *C. elegans,* but the former name belongs to a distinct species of the United States.

4. CAMPELIA L. Rich.

The single species, *C. zanonia* (L.) H. B. K., is frequent in forests. It is a stout perennial about 1 meter high, with simple or sparsely branched stems, the leaves lanceolate, pubescent beneath. The flowers are white, the fruit dark blue. In Salvador the plant is known as "caña de Cristo" and "coyontura," and is much employed as a remedy for venereal diseases.

5. **DICHORISANDRA** Mikan

The only Central American species, *D. hexandra* (Aubl.) Standl., is rather rare in forests about the zone. It is an erect herb about a meter high with terminal panicles of small blue flowers.

6. **POGOMESIA** Raf.

Pogomesia leiocalyx (Clarke) Standl. (*Tinantia leiocalyx* Clarke) is rare about the zone. It is a glabrous herb a meter high or less with large ovate leaves and umbels of green flowers. The only other Central American species, *P. erecta* (Jacq.) Standl. (*Tinantia erecta* Schlecht.), with glandular-pilose (rather than glabrous) sepals, has been collected in Chiriquí.

7. **LEPTORRHOEO** Clarke

The single species of the genus is *L. filiformis* (Mart. & Gal.) Clarke, common about the zone. It is a low slender plant with branched stems, oblong-linear leaves, and small, white or pale blue flowers.

8. **TRADESCANTIA** L.

Leaves long-pilose beneath. Flowers in lax dichotomous panicles, white; stamens equal in length........................**1. T. geniculata** Jacq.
Leaves glabrous.
  Stamens equal in length; petals white; plants very pale green, prostrate and forming dense mats; leaves about 2 cm. long....**2. T. cordifolia** Swartz.
  Stamens unequal; petals white or pink; plants deep green, erect or ascending; leaves mostly 5 to 8 cm. long................**3. T. cumanensis** Kunth.

One other species, *T. commelinoides* Roem. & Schult., has been collected in the mountains of Panama. The Panama species all have small flowers, and in general appearance bear little resemblance to the species of the United States, which are called spiderwort. The name "palm-grass" is given to *T. cumanensis* by the Barbadians of the zone.

16. PONTEDERIACEAE. Pickerelweed Family

Stamens 3; flowers small, white or blue, in few-flowered lax spikes. Plants growing in mud................................**1. HETERANTHERA.**
Stamens 6; flowers large, showy, blue, white, or violet, in large dense spikes.
  Perianth with a short tube; fruit 1-celled and 1-seeded; plants growing in mud. **2. PONTEDERIA.**
  Perianth with an elongate tube; fruit 3-celled, many-seeded; plants floating in water..**3. PIAROPUS.**

No other genera are represented in Central America. The plants grow in mud or water and have broad, ovate or cordate, entire, long-petioled leaves.

1. **HETERANTHERA** Ruiz & Pav.

Leaves broadly reniform; flowers white, little exserted from the sheath. **1. H. reniformis** Ruiz & Pav.
Leaves ovate; flowers usually blue, much exserted from the sheath. **2. H. peduncularis** Benth.

The only other Central American species, *H. limosa* (Swartz) Willd., with 1-flowered spathes, has been collected in Panama. *H. reniformis* is common about the zone, but *H. peduncularis* has been found only near Matías Hernández. All the species mentioned occur in the United States.

2. **PONTEDERIA** L. PICKERELWEED

The only species, *P. cordata* L., is frequent here. It is widely distributed in the Western Hemisphere, being common in the United States and extending northward to Nova Scotia. The flowers are blue or white, the plants collected in the zone having white flowers. The plant is known in Salvador as "balsa" and in Guatemala as "lechuga de agua."

3. **PIAROPUS** Raf. WATER-HYACINTH

The only species native in Central America is *P. azureus* (Swartz) Raf. (*Eichhornia azurea* Kunth), but the common water-hyacinth of South America, *P. crassipes* (Mart.) Raf. (*E. crassipes* Solms), is sometimes cultivated as in the United States, and in some places has become naturalized. In *P. crassipes* the petioles are inflated and bulblike; in *P. azureus* they are not inflated. The native water-hyacinth is plentiful about Gatún Lake, and at times it has multiplied to such an extent as to threaten navigation, but it has been kept under control and is no longer a serious menace.

The family Juncaceae is represented in the mountains of Panama.

17. LILIACEAE. Lily Family

Plants stemless; flowers in racemes........................1. **SANSEVIERIA.**
Plants with erect leafy stems; flowers in panicles.
  Stems slender; leaves thin, veined, green or red; flowers very small. 2. **TAETSIA.**
  Stems thick (often 30 cm.); leaves thick, stiff, sharp-pointed, not veined, green; flowers large (about 4 cm. long)........................3. **YUCCA.**

The only genus represented in Panama by native species is *Vagnera*, which is found in the mountains. To the family belong such well-known cultivated plants as asparagus, lilies, hyacinths, and tulips, none of which, except some of the ornamental species of *Asparagus*, are grown here.

The plants of the family are very diverse as to habit and leaves. The flowers are 6-parted, with 6 stamens. The fruit is a capsule or berry.

1. **SANSEVIERIA** Thunb. BOWSTRING-HEMP

Sansevieria guineensis (Jacq.) Willd., native of tropical Africa, known as bowstring-hemp or more commonly as sansevieria, is cultivated frequently for ornament. It is a rather common house plant in the United States. The stiff swordlike leaves are erect and dark green, with transverse silver markings. Some species of the genus are important fiber plants.

2. **TAETSIA** Medik. DRACENA

The better-known name for the genus is *Cordyline*. The plants, as cultivated, are usually called dracenas. *T. fruticosa* (L.) Merrill, chiefly in its variety *ferrea* (Baker) Standl., is a common ornamental plant and sometimes runs wild about the zone. The slender simple stems are 1 to 2.5 meters high. The leaves are linear-lanceolate and about 30 cm. long, green or, in the variety, colored red or purple. The flowers are inconspicuous.

3. **YUCCA** L. YUCCA

The only Central American species is *Y. elephantipes* Regel, which is planted occasionally about the zone. The species extends northward to Mexico, but it is not known in a truly wild state. It is a tree, 3 to 10 meters high, with few branches, which are densely covered near their ends with daggerlike leaves 0.5 to 1 meter long. The flower panicle is very large and erect, the flowers creamy white and bell-shaped. In Panama as well as elsewhere the tender flowers are cooked and eaten, usually fried with eggs. They are very palatable so prepared and it is rare to find in Central America a developed panicle, since all are gathered for food before maturity.

Species of *Yucca* are most abundant in Mexico and the southwestern United States, where they are the dominant plant over large areas. In the Southwest they are often known as "Spanish-dagger" and "Spanish-bayonet," and often erroneously as "cactus." *Y. elephantipes* is known in Panama as "palmito," and the name "espinero" is said to be applied to it. In Costa Rica it is called "itabo," and in Guatemala, Salvador, and Honduras "izote," an Aztec name.

18. SMILACACEAE. Sarsaparilla Family

1. **SMILAX** L. SARSAPARILLA. GREENBRIER

Plants copiously pubescent; stems unarmed. Leaves usually 5-nerved. 1. **S. mollis** Willd.

Plants glabrous; stems usually armed with stout prickles.
  Peduncles much longer than the petioles. Leaves usually 3-nerved, often acute at base; flowers 3 to 4 mm. long........2. **S. panamensis** Morong.
  Peduncles shorter than the petioles. Leaves usually 5 or 7-nerved.
    Staminate flowers 1 to 2 mm. long; leaves not shining. 3. **S. mexicana** Griseb.
    Staminate flowers 3 to 5 mm. long; leaves shining..4. **S. domingensis** Willd.

Other species occur in Panama. The plants are small or large, woody or suffrutescent vines, with leafy, usually prickly stems, the oblong to ovate, entire leaves having 3 to 7 conspicuous longitudinal nerves. The small dioecious flowers, borne in axillary umbels, have 6 stamens. The fruit is a globose, black or red berry containing 1 to 6 seeds. Numerous species occur in the United States, where they are known as "catbrier," "greenbrier" and "horsebrier." From the dried roots of some of the tropical American species is obtained the sarsaparilla of commerce, which is used for flavoring beverages, and in medicine as a remedy for rheumatism and scrofulous and cutaneous diseases. It is doubtful whether any of the species growing about the zone produce sarsaparilla.

S. panamensis is called "zarza" (bramble) locally, and it is probable that the same name is applied to the other species. *S. mexicana* is known in Nicaragua as "espina corona"; in Costa Rica as "zarzón"; and in Salvador as "bejuco de corona," "zarzaparrilla," and "espuela de gallo."

19. HAEMODORACEAE. Bloodwort Family

1. **XIPHIDIUM** Aubl.

The only Central American member of the family, *X. caeruleum* Aubl., common in forests of the zone, is a perennial with rootstocks. The leaves are iris-like, equitant (the edges turned to the stem), and 1.5 to 5 cm. wide. The small whitish flowers in terminal panicles have 6 segments and 3 stamens. The fruit is a 3-celled, many-seeded, dull red berry. The local name is "palmita;" in Salvador the plant is known as "palma" and "palma del norte." Small plants are sometimes produced on the branches of the inflorescence.

20. AMARYLLIDACEAE. Amaryllis Family

Leaves thick, stiff, with spines or small spiny teeth along the margins.
  Leaves tipped with a sharp spine, the margins also with numerous spiny teeth; perianth funnelform..**1. AGAVE.**
  Leaves sharp-pointed but not spine-tipped, the margins with few small teeth; perianth rotate..**2. FURCRAEA.**
Leaves thin, unarmed, entire.
  Plants hairy, with corms; flowers yellow....................**3. CURCULIGO.**
  Plants glabrous, with bulbs; flowers white, pink, or red.
    Filaments connected by a thin cuplike membrane; flowers white. **4. HYMENOCALLIS.**
    Filaments free; flowers pink or red..........................**5. CRINUM.**

The genus *Bomarea* is represented in the mountains of Panama. To the family belong the tuberose (*Polianthes*) and the various plants that pass under the name amaryllis (chiefly species of *Hippeastrum*). The plants of the family as represented in Panama are of diverse appearance, but all have basal leaves and scapose stems. The perianth is 6-parted, and there are usually 6 stamens; the 3-celled ovary is inferior and the fruit a capsule.

1. AGAVE L. CENTURYPLANT

Leaves green; native plant............................**1. A. panamana** Trel.
Leaves with pale yellow margins; cultivated plant....**2. A. picta Salm-Dyck.**

Agave panamana was described from Uravá Island, near Taboga. Upon some of the other small islands in the vicinity there are plants that probably belong to the same species, which is known only from these islands. *A. picta*, probably of Mexican origin, is planted in Balboa, and it may be that other species also are cultivated.

There are few species of *Agave* in Central America, but from Mexico 170 are known. They are of great economic importance, especially as a source of fiber. From plants cultivated on a large scale in Yucatán is obtained the henequen fiber from which binder twine is manufactured. In Mexico some of the species are planted extensively for the extraction of the beverages known as pulque, mescal, and tequila.

2. FURCRAEA Vent.

Furcraea cabuya var. *integra* Trel. is common on rocky slopes along the Pacific coast, especially about Bella Vista, and is sometimes planted for ornament, particularly for hedges. In general appearance it is like the century-plants, but the leaves, although sharp-pointed, are not spine-tipped. They are 1 to 1.5 meters long, stiff, with only a few minute teeth on the margins. The flower panicles are several meters high, and most of the flowers are replaced by bulblets. The leaves yield a tough fiber, that of some of the Central American species being an important commercial article. *F. cabuya* is known in Costa Rica as "cabuya."

3. CURCULIGO Gaertn.

The only Central American species, *C. scorzoneraefolia* (Lam.) Baker, is infrequent about the zone. It has linear nerved grasslike leaves and bright yellow, 6-parted flowers about 3 cm. broad, with a very slender, hairy perianth tube.

4. HYMENOCALLIS Salisb. SPIDERLILY

Hymenocallis americana (L.) Salisb., common along the Atlantic beaches and occasional elsewhere, is a lilylike plant with bulbs, strap-shaped leaves, and heads of showy white flowers. The very slender perianth tube is 20 cm. long and the linear segments over half as long. The West Indians call the plant "euchar lily."

5. CRINUM L.

Crinum longiflorum Herb. is often cultivated for ornament and has run wild in swamps along the Atlantic coast and about old settlements. It is believed to be a native of Africa. The bulbs are very large, 10 cm. or more in diameter, and have a long neck. The huge recurved leaves are 10 cm. wide or more, the umbellate flowers about 20 cm. long and pink or reddish. In Salvador the plant is known as "lirio."

The genus *Vellozia*, of the family Velloziaceae, is known from Panama.

21. DIOSCOREACEAE. Yam Family

1. DIOSCOREA L. YAM

Leaves 3 or 5-lobed .... **1. D. trifida** L. f.
Leaves entire.
Stems narrowly winged .... **2. D. alata** L.
Stems not winged.
Leaves pubescent beneath. Staminate flower clusters short-pedunculate.
Leaves caudate-acuminate, densely pubsecent beneath even in age. **3. D. permollis** Knuth.
Leaves merely acuminate, glabrate beneath in age. **4. D. cymosula** Hemsl.
Leaves glabrous.
Staminate flowers densely pubescent. Leaves narrowly deltoid-cordate. **5. D. sapindoides** Presl.
Staminate flowers glabrous.
Leaves lanceolate; flowers pedicellate .... **6. D. panamensis** Knuth.
Leaves broadly ovate to rounded-cordate; flowers sessile.
Leaves abruptly cuspidate .... **7. D. urophylla** Hemsl.
Leaves acuminate.
Flowers open, the segments subequal. **8. D. macrostachya** Benth.
Flowers nearly closed, the outer segments much shorter than the inner .... **9. D. cayenensis** Lam.

The plants are herbaceous vines with long-petioled, opposite or alternate leaves, the very small flowers dioecious and arranged in simple or branched spikes or racemes. The fruit is a large 3-angled capsule.

D. panamensis and *D. permollis* are known only from the zone, the types of both species having been collected on Ancón Hill. *D. urophylla*, known only from the vicinity of the zone, is said to be known as "bejuco de saina." The most common species is *D. macrostachya*.

D. trifida is one of the cultivated yams, and is known as "ñame" and "yampí." *D. alata* and *D. cayenensis* also are cultivated species, all three having been introduced from the Old World. Yams are grown commonly in this region for their large edible roots, which somewhat resemble sweet potatoes, and are used in the same way, being an important article of food in many parts of tropical America. In the United States the name yam is given to varieties of sweet-potatoes (*Ipomoea batatas*), plants not at all closely related. *D. cayenensis* is said to be known in Panama as "ñame de Guinea" and "ñame chomo," and to be much inferior to the other species mentioned. The native species do not have edible roots. The cultivated species have run wild in many places about the zone.

22. IRIDACEAE. Iris Family

Style branches opposite the stamens; scapes broadly winged; outer perianth segments white, the inner blue; plants with short rootstocks..**1. MARICA.**

Style branches alternate with the stamens; scapes not winged; flowers white; plants with bulblike corms..................................**2. CIPURA.**

The genus *Sisyrinchium* is represented in Panama.

1. MARICA Ker

The only Central American species, *M. gracilis* Herb., has been collected on Barro Colorado Island.

2. CIPURA Aubl.

Cipura paludosa Aubl., probably the only species of the genus, is rather frequent in savannas and thickets. The showy white flowers are extremely delicate, withering almost immediately after being picked. They are open only in the morning.

23. MUSACEAE. Banana Family

Leaves arranged in spirals; flowers unisexual; cultivated plants......**1. MUSA.**

Leaves 2-ranked; flowers perfect; native plants...............**2. HELICONIA.**

1. MUSA L.

The two common species of the genus, both natives of the Old World, are planted abundantly about the zone, and have a tendency to become naturalized. *M. paradisiaca* L. is the plantain, whose fruit resembles the banana but is larger and edible only when cooked. It is a favorite vegetable throughout Central America. The Spanish name is "plátano."

M. sapientum L. (often considered a variety of *M. paradisiaca*) is the common banana, of which there are extensive plantations about Gatún Lake. The banana is one of the popular fruits of Central America, and is of great economic importance both for export and for local consumption. In many parts of Central America fried or roasted bananas are one of the most important foods. In Panama almost the only banana seen is the common one, known here as "guineo," "patriota," or "banana," and in Salvador as "guineo de seda." This is the variety consumed so extensively in the United States. A variety with small fruits is sold in Panama markets, but is little used except as food for birds. Elsewhere in Central America several other varieties are frequent, chiefly forms whose flesh is coarse and fibrous and usually is eaten only when cooked.

2. HELICONIA L.

Bracts of the inflorescence densely crowded and overlapping, appressed, concealing the rachis. Plants very large, often 5 meters high or more; leaves green beneath; inflorescence very large and heavy, usually 30 cm. long or often much longer, pendent; bracts about as broad as long, red.
1. H. mariae Hook.

Bracts distant, not or scarcely overlapping, spreading or reflexed, not concealing the rachis.
  Inflorescence pendent.
    Bracts nearly as broad as long when spread out; leaves glaucous beneath. Plants large, usually 3 to 4 meters high; inflorescence much elongate; bracts dark red, pubescent............**2. H. curtispatha** Peters.
    Bracts twice as long as broad or longer, leaves green beneath. Large plants.
      Inflorescence glabrous. Bracts scarlet and yellow, with green margins. **3. H. bihai** L.
      Inflorescence, at least the rachis, tomentose.
        Bracts villous, dark red....................**4. H. pendula** Wawra.
        Bracts glabrous or puberulent, red and yellow..**5. H. platystachys** Baker.
  Inflorescence erect.
    Leaves large, usually 20 to 30 cm. wide; bracts usually numerous in an elongate spike. Bracts red, often tinged with yellow or orange; inflorescence glabrous..........................**6. H. latispatha** Benth.
    Leaves small, usually less than 10 cm. wide; bracts few, in a short spike.
      Bracts red; rachis of the spike glabrous or nearly so. **7. H. acuminata** Rich.
      Bracts pale greenish yellow; rachis densely pubescent. **8. H. straminea** (Griggs) Standl.

Other species are known from Panama. The plants are coarse herbs, the larger ones resembling bananas in habit, while the smaller ones suggest cannas. They are among the most abundant and conspicuous plants of the zone. The concave bracts often hold water, and it has been stated that mosquitoes breed in them. The name *Bihai* has been used for the genus.

H. mariae (pl. 12) is abundant in many places on the Atlantic slope, often forming extensive and almost impenetrable thickets. Dr. C. V. Piper suggested the name "beefsteak heliconia" for this species, and the name is a descriptive one, because the huge heavy pendent flattened spikes look not unlike a raw beefsteak. The West Indians give the names "wild banana" and "wild plantain" to this and the other species. The most common Spanish name for all the species, throughout Central America, is "platanillo." *Heliconia wagneriana* Peters, described from the Canal Zone, is probably synonymous with *H. mariae*, and *Bihai punicea* Griggs is certainly a synonym.

H. curtispatha (*Bihai longa* Griggs is a synonym) is frequent on the Atlantic slope, and is nearly as large a plant as *H. mariae*. The pendent spikes are often a meter long. *H. pendula* also is occasional in the same region.

H. bihai is a frequent and showy plant of the Atlantic watershed, and is probably the handsomest of the local species because of the brightly colored bracts. *H. platystachys*, although widely distributed, is a rather rare plant.

H. latispatha (pl. 13) is frequent in the forests of both slopes. It is a smaller plant than the preceding species, but sometimes 3 meters high. It is known locally as "platanillo" and "guacamaya" (macaw).

H. acuminata seems to be confined to the Atlantic watershed. It is slender and 1.5 to 2 meters high. Locally it is called "platanillo" and "lengua de vaca."

H. straminea has been collected only on the Pacific slope, where it is abundant. It is the smallest of the local species, usually about a meter high, but occasionally attaining a height of 2 meters. Because of its pale and small bracts, it is much less conspicuous than the other species. It is said to be known here as "San Juanillo." The species is known only from Panama.

24. ZINGIBERACEAE. Ginger Family

Leaves spirally arranged.
  Ovary 3-celled; bracts longer than the fruit__________________1. **COSTUS.**
  Ovary 2-celled; bracts much shorter than the fruit____2. **DIMEROCOSTUS.**
Leaves 2-ranked.
  Lateral staminodia large, petal-like. Cultivated plant_______3. **CURCUMA.**
  Lateral staminodia small and inconspicuous.
    Lip of the corolla 3-lobed; roots with odor and flavor of ginger. 4. **ZINGIBER.**
    Lip not 3-lobed; roots not with odor and flavor of ginger.
      Flowers in dense racemes terminating leafy stems. Cultivated plant. 5. **ALPINIA.**
      Flowers in terminal conelike spikes or in basal panicles. Native plants. 6. **RENEALMIA.**

The plants of the ginger family are large herbs with elongate leafy stems. The leaves are mostly lanceolate or oblanceolate, large, and furnished with sheaths. The inflorescence is bracted, the flowers irregular, with only one fertile stamen. The fruit is usually berrylike.

1. COSTUS L

Bracts of the flower spike with foliaceous spreading terminal appendages; plants hirsute__________________________________1. **C. villosissimus** Jacq.
Bracts not appendaged; plants not hirsute.
  Spikes fusiform, the bracts closely appressed in age. 2. **C. sanguineus** Donn. Smith.
  Spikes cylindric or subglobose, the bracts in age lax and often spreading.
    Spikes about 4 cm. thick_________________3. **C. spicatus** (Jacq.) Swartz.
    Spikes about 7 cm. thick_______4. **C. splendens** Donn. Smith & Tuerckh.

Other species occur elsewhere in Panama. All those listed are similar in habit, having tall simple stems and numerous oblanceolate leaves. *C. villosissimus* (pl. 14) is perhaps most abundant. Its stems are often 3 meters high, the leaves very hairy, and the bracts crimson with green appendages. It is known as "cañagria" and "caña de mico," and is said to be a remedy for venereal diseases. *C. spicatus* (pl. 15), almost equally abundant, is a smaller plant with dull red bracts, known in Salvador as "caña de Cristo." *C. splendens* has been collected only along the Atlantic coast.

The stems in this genus consist of the tightly rolled sheaths of the leaves.

2. DIMEROCOSTUS Schum

The only Central American species, *D. uniflorus* (Poepp.) Schum., is a common and conspicuous plant growing in wet forest or along the edge of water. The stout simple stems are 3 to 4 meters high, and formed of numerous sheathing leaves with oblanceolate blades. The terminal flower spike persists for a long time. The large bracts and tubular calyx are coriaceous. The flowers open one at a time, and the pure white lip is 7 to 8 cm. long and very delicate. The fruit is orange. The plant is known here as "cañagria."

3. CURCUMA L. TURMERIC

Curcuma longa L., native of India, is sometimes planted here as elsewhere in Central America. In general appearance it is much like ginger. The thick rootstocks furnish turmeric, which is employed as a dye and condiment.

4. ZINGIBER Adans. GINGER

Zingiber officinale Rosc. is frequent in gardens, and on Taboga Island it is well naturalized. It is a native of tropical Asia. The aromatic rhizomes are the ginger of commerce. In cultivation the plant rarely flowers. It is a reedlike plant, usually about a meter high, with linear-lanceolate leaves, the flower spikes, borne on leafy stems, about 5 cm. long, and the lip of the corolla purple with yellow spots. The Spanish name is "gengibre."

5. ALPINIA L. SHELLFLOWER

Alpinia speciosa (Wendl.) Schum., native of the East Indies, is cultivated occasionally for ornament. It has leafy stems 1 to 2 meters high, forming dense clumps, and ample lanceolate leaves. The large flowers are arranged in drooping spikelike racemes, the bracts white and red, the lip of the corolla yellow, brown-red within. In Salvador the plant is known as "perlas de la Oriente."

6. RENEALMIA L. f.

Flowers borne in a conelike spike terminating the leafy stem.
1. **R. strobilifera** Poepp. & Endl.
Flowers borne in bracted panicles rising from the base of the plant.
2. **R. aromatica** (Aubl.) Griseb.

Renealmia strobilifera is a common and showy plant of wet forests. The stems are 1.5 to 3 meters high, the leaves oblong-lanceolate, and the bracts orange. The sterile stems of *R. aromatica* (pl. 16) often form large clumps, and are 1 to 2.5 meters high. The fruit is red or dark blue, with orange pulp.

25. CANNACEAE. Canna Family

1. CANNA L. CANNA

Flowers yellow; staminodia 2.................................1. **C. lutea** Mill.
Flowers red; staminodia 3.........................2. **C. warscewiczii** Dietr.

Other species occur in Panama. Those listed closely resemble the cultivated cannas, but have small flowers. The large-flowered horticultural forms are common ornamental plants about the zone, and the name "bandera española" (Spanish flag) is given them. For the native species I was given the name "café cimarrón" (wild coffee), doubtless an allusion to the round black shotlike seeds. In other parts of Central America the wild cannas are known as "bijagua," "platanillo," and "cerbatana." The seeds are often used by boys in popguns and the wide leaves are employed for wrapping articles of food. The cultivated cannas are hybrids of various species, their ancestry not known with certainty in most cases.

26. MARANTACEAE. Maranta Family

Ovary 3-celled, the fruit 3-seeded. Inflorescence of one or more dense spikes.
1. **CALATHEA.**
Ovary 1-celled, the fruit 1-seeded.
  Perianth purple; rachis of the racemes strongly zigzag. Staminodium one; inflorescence racemose-paniculate.........................2. **THALIA.**
  Perianth not purple, usually white; rachis not zigzag.
    Bracts of the inflorescence early deciduous. Staminodia 2; inflorescence laxly paniculate.......................................3. **MARANTA.**
    Bracts persistent, large and conspicuous.
      Flower spikes terete, the bracts closely appressed; leaves whitish beneath.
4. **ISCHNOSIPHON.**

Flower spikes compressed; leaves not pale beneath.
  Staminodium one; leaves dark red beneath; bracts approximate, closely appressed .... **5. PLEIOSTACHYA.**
  Staminodia 2; leaves green beneath; bracts rather remote, loose and spreading .... **6. MYROSMA.**

The plants are large perennial herbs, the leaves having sheaths and petioles and large broad blades. The flowers are often showy, usually white, yellow, or purple, and subtended by bracts, the perianth regular or nearly so. There is one fertile stamen and one or more staminodia.

1. CALATHEA Meyer

Spikes small, with 5 or fewer bracts, these spirally imbricate.
  Bracts and scapes puberulent, the bracts about 1 cm. long. **1. C. albicans** Brongn.
  Bracts and scapes hirsute, the bracts 3 to 4 cm. long .. **2. C. hirsuta** Standl.
Spikes larger, with usually numerous (at least more than 5) bracts.
  Bracts distichous, the spikes somewhat compressed.
    Bracts densely pilose, pergamentaceous ... **3. C. lasiostachya** Donn. Smith.
    Bracts glabrous or nearly so.
      Bracts coriaceous .... **4. C. lutea** (Aubl.) Meyer.
      Bracts thin, parchment-like .... **5. C. insignis** Peters.
  Bracts spirally arranged, the spikes not at all compressed.
    Flower scape bearing one or more large leaves.
      Perianth dark purple outside .... **6. C. violacea** (Rosc.) Lindl.
      Perianth white or cream-colored .... **7. C. macrosepala** Schum.
    Flower scape naked.
      Spike about 1 cm. thick, as long as the scape or longer; plants small, about 30 cm. high .... **8. C. panamensis** Rowlee.
      Spike about 8 cm. thick, many times shorter than the scape; plants large, more than a meter high .... **9. C. altissima** Koern.

Some of the species are common and conspicuous plants about the zone. The bracts are sometimes handsomely colored, although the flowers are seldom showy. *C. albicans*, a small plant, 30 cm. high or less, is rare. *C. hirsuta* is known only from this region, having been collected only at Alhajuela and on Ancón Hill; and *C. lasiostachya* (pl. 17) has been found only along Caño Quebrado. *C. lutea* is one of the common species, a large plant, often 3 meters high, the bracts bronze and the perianth yellow. This species is known here as "hoja blanca," and in Salvador as "hoja de sal." *C. insignis* (pl. 18) grows on the Atlantic slope. *C. violacea* and *C. macrosepala* are very common in woods. It is probable that both are forms of a single species. They are known locally as "bijao," in Guatemala as "hoja de sal," and in Salvador as "chufle." In the latter country the young inflorescences are cooked and eaten, being sold in the markets for this purpose. *C. panamensis* has been found here only in the region between Panama City and Chepo, but it occurs also in Costa Rica. *C. altissima* is known in the zone only from the Cuatro Calles Hills, near Matachín.

2. THALIA L.

The only Central American species, *T. geniculata* L., frequent in swamps and marshes, is a slender herb, usually 1 to 2 meters high, with large, lanceolate or ovate leaves and small purple flowers. The rachis of the inflorescence is zigzag. In Salvador the plant is called "platanillo."

3. MARANTA L. ARROWROOT

Maranta arundinacea L., frequent in moist thickets near the Pacific, is a slender branched herb a meter high or less, with ovate-lanceolate leaves and loose panicles of small white flowers. From the rootstocks is extracted in some regions one of the forms of starch known as arrowroot. About the zone, as in Costa Rica, the plant is called "sagú." The name "platanillo" is used in Mexico and Salvador, and "juquilla silvestre" in Salvador.

4. ISCHNOSIPHON Koern.

The only Central American species, *I. leucophaeus* (Poepp. & Endl.) Koern., is occasional in swamps and moist thickets. The slender stems are about a meter high, the large broad leaves whitish beneath. The spikes are usually numerous, slender, and terete, the flowers white. For the plant I was given the names "chichica" and "faldo."

5. PLEIOSTACHYA Schum.

Pleiostachya pruinosa (Regel) Schum. is frequent in forests and swamps. The plants are 1 to 3 meters high, and are distinguished in the family by having the large thin leaves dark red or purple beneath. Two other species are found in Panama.

6. MYROSMA L. f.

Plants low, about 40 cm. high; inflorescence of simple racemes.
1. **M. panamensis** Standl.
Plants tall, 1 to 2.5 meters high; inflorescence of branched racemes.
2. **M. guapilensis** Donn. Smith.

Myrosma panamensis is an endemic species, growing in wet forest. *M. guapilensis* (pl. 19) is frequent in forests of the Atlantic slope. Both species have large oval leaves.

27. BURMANNIACEAE. Burmannia Family

Stamens 6; flower one.....................................1. **OPHIOMERIS.**
Stamens 3; flowers several, in a head.......................2. **BURMANNIA.**

1. OPHIOMERIS Miers

The only North American species, *O. panamensis* Standl., is endemic here, having been found only on Barro Colorado Island, where it grows in dark wet forest. It is a slender pink saprophytic herb, 5 to 10 cm. high. The single flower is about 1.5 cm. long, gibbous, the three inner perianth segments terminating in filiform appendages about 3 cm. long. Two other species of the genus are known, both natives of Brazil.

2. BURMANNIA L.

Burmannia capitata L. has been collected in wet savannas near Nuevo San Francisco. A widely dispersed plant of tropical America, it extends northward to Florida. The stems are very slender, simple, with few appressed linear leaves. The small flowers are crowded into a dense head.

28. ORCHIDACEAE. Orchid Family

(Contributed by Prof. Oakes Ames)

I. Subfamily DIANDRAE. Fertile anthers 2, borne laterally on the column; lip a large simple inflated sac with entire incurved margins-- 1. **SELENIPEDIUM.**

II. Subfamily MONANDRAE. Fertile anther 1; lip not a simple sac, or if so (*Catasetum*) with lateral margins of the orifice denticulate.

A. Anther persistent, attached to the column by a broad base; pollinia attenuated to form caudicles which emerge *from the base of the anther cells;* lip extended posteriorly into an elongate slender spur; terrestrial herbs with racemose flowers-------------------------------- 2. **HABENARIA.**

A. Anther commonly deciduous, often affixed by a slender filament; pollinia either without caudicles or with the latter emerging *from the apex of the anther;* lip either without posterior extension or with a short saccate spur; terrestrial or epiphytic.

1. Pollinia disintegrating into granular or powdery masses or sectile.

a. Stems scandent; plant a long creeping vine------------ 3. **VANILLA.**

a. Stems not scandent; erect herbs.

2. Anther terminal, not inserted on the back of the column.

b. Leaf blades not jointed to sheaths.

3. Leaves contracted into petioles; inflorescences lateral and terminal in few-flowered racemes; flowers small; sepals about 1.5 cm. long---------------------------------- 4. **ROLFEA.**

3. Leaves sessile; inflorescences axillary; flowers solitary, large; sepals 4 cm. or more long---------------- 5. **CLEISTES.**

Leaf blades conspicuously jointed to sheaths.

4. Flowers small, in heads or dense racemes. Floral bracts longer than the ovary----------------------- 6. **ELLEANTHUS.**

4. Flowers large and showy, solitary or in loose few-flowered clusters------------------------------------ 7. **SOBRALIA.**

2. Anther posterior, inserted on the back of the column below the summit.

c. Lip forming the uppermost segment of the perianth, inserted above the base of the column--------------- 8. **PONTHIEVA.**

c. Lip forming the lowermost segment of the perianth, not inserted on the column

5. Flowers small, the sepals 6 mm. long or less; column foot short or obsolete----------------------- 9. **SPIRANTHES.**

5. Flowers large, the sepals 1.2 cm. or more long; column foot long-decurrent on the ovary.

d. Flower with a short conical spur; lateral sepals straight; rostellum a long rigid point--- 10. **STENORRHYNCHUS.**

d. Flowers without a distinct spur; lateral sepals strongly decurved; rostellum a blunt membranaceous organ. 11. **SARCOGLOTTIS.**

1. Pollinia waxy, forming definite masses in which the pollen grains cohere firmly.

e. Flower shoot normally terminal at the tip of a slender or thickened stem (except *Epidendrum stamfordianum*, *Epidendrum rousseauae.*)

6. Leaves membranaceous, soft and pliable; lamina (in our species) not jointed to the sheath------------------- 12. **LIPARIS.**

6. Leaves coriaceous, hard and rigid; lamina jointed to the sheath.

f. Sepals much more conspicuously developed than the petals and lip, often coherent to form a tube.

7. All three sepals united below to form a cup.

g. Sepals connivent at the tip, forming a tube with side openings. 13. **CRYPTOPHORANTHUS.**

g. Sepals free at the tip.

8. Tips of the sepals contracted into subulate tails. 14. **MASDEVALLIA.**

8. Tips of the sepals without long tails, at most shortly acuminate.................................15. **STELIS.**

7. Dorsal sepal free or nearly so.

h. Pollinia 2 or 4; petals commonly much smaller than the sepals. 16. **PLEUROTHALLIS.**

h. Pollinia 8; petals and sepals similar.....17. **OCTOMERIA.**

f. Sepals and petals about equally developed, the lip often conspicuous.

9. Column produced into a distinct foot; lateral sepals decurrent on the foot, forming a chin.

i. Stems consisting of fusiform-thickened members, often superposed, bearing a pair of leaves and abbreviated racemes at the summit.

10. Lip forming a pouchlike cavity at the base of the column. 18. **HEXISEA.**

10. Lip without a cavity at the base.19. **SCAPHYGLOTTIS.**

i. Stems thickened at the base, irregularly leafy above; racemes (often compound) on elongated peduncles. 20. **POLYSTACHYA.**

9. Column without a foot.

j. Pollinia 4, sometimes cohering in pairs.

11. Lip, near the base, with 2 large hornlike calli on the upper surface and 2 corresponding excavations on the under surface.................................21. **DIACRIUM.**

11. Lip without large hornlike calli near the base.

k. Stems leafy, or when pseudobulbous the peduncle not concealed by a large membranaceous spathe. 22. **EPIDENDRUM.**

k. Stems pseudobulbous-fusiform, leafy only at the summit; peduncle concealed by a large membranaceous spathe. 23. **CATTLEYA.**

j. Pollinia 8. Leaves semiterete...........24. **BRASSAVOLA.**

e. Flower shoot lateral.

12. Main axis composed of annual members of which each one terminates the year's growth.

l. Leaves convolute, pliable, not coriaceous.

13. Plants without true pseudobulbs—either with subterranean tuber-like swellings or with swollen elongated jointed stems.

m. Pollinia 8.

14. Lateral sepals forming a prominent chin; sepals (in our species) yellow and red...................25. **CHYSIS.**

14. Lateral sepals not forming a chin; sepals rose-purple. 26. **LIMODORUM.**

m. Pollinia 2 or 4.
  15. Stem with a short subglobose thickening at the base; lip saccate at base and without teeth or fringes. **27. EULOPHIA.**
  15. Stem elongated, swollen, bearing leaves throughout; lip, if saccate at the base, with teeth or fringes.
    n. Flowers perfect, of one form; column twisted. **28. MORMODES.**
    n. Flowers of two forms, male and female; column not twisted.
      16. Lip distinctly saccate, at least the lower part; column thick, straight, usually with long bristle-like antennae________________________**29. CATASETUM.**
      16. Lip not saccate; column curved or bent, without antennae____________________**30. CYCNOCHES.**
13. Plants with true pseudobulbs which are 1 to 4-leaved at the summit.
  o. Lip not saccate at base, articulated with the column foot, not divided into hypochil and epichil.
    17. Inflorescence 1-flowered; flower relatively large. **31. LYCASTE.**
    17. Inflorescence many-flowered; flowers small. **32. XYLOBIUM.**
  o. Lip saccate or strongly concave at base or throughout, continuous with the column foot, divided (except in *Sievekingia*) into a distinct hypochil and epichil.
    18. Sepals and petals connivent.
      p. Flowers fleshy, in an erect raceme (in our species); lip 3-lobed________________________**33. PERISTERIA.**
      p. Flowers membranaceous, in a pendulous raceme; lip simple________________________**34. SIEVEKINGIA.**
    18. Sepals and petals spreading or reflexed.
      q. Lip with a helmet-shaped hypochil, without a pair of linear lobes or bristles; lateral sepals very strongly curved, asymmetric____________**35. CORYANTHES.**
      q. Lip without a helmet-shaped hypochil, provided (in our species) with a pair of linear or bristle-like protuberances.
        19. Flowers large and showy, in few-flowered racemes; petals free; lip without basal horns and without bristles______________________**36. STANHOPEA.**
        19. Flowers small, in many-flowered racemes; petals inserted on the column, much reduced; lip with a pair of basal horns and median bristles__**37. GONGORA.**
1. Leaves conduplicate, coriaceous (except in *Chondrorrhyncha*).
  20. Rachis of the inflorescence conspicuously thickened. Flowers sessile or nearly so_______________**38. BULBOPHYLLUM.**
  20. Rachis of the inflorescence not conspicuously thickened; flowers pedicellate.
    r. Lip movably jointed to the column foot (lateral sepals not curved-reflexed), or if otherwise (*Ornithidium*), with the densely flowered racemes abbreviated and borne in clusters.
      21. Sepals at the base not connivent into a tube; flower not on an elongate peduncle.

- s. Lip sessile, easily movable.
  - 22. Pollinia almost sessile on the broad viscid disk; lip callus without long hairs-------39. **MAXILLARIA.**
  - 22. Pollinia with oblong stalks; lip callus with long tubercular hairs or papillae on basal half. 40. **CAMARIDIUM.**
- s. Lip clawed, rigidly joined to the column foot. 41. **ORNITHIDIUM.**

21. Sepals at base connivent into a tube; flower on an elongate peduncle subequaling the flower---42. **TRIGONIDIUM.**

r. Lip rigidly connected with the column foot.

23. Rostellum terminal, erect, conspicuous; anther behind the rostellum and parallel to it.
    - t. Lip 3-lobed, the mid-lobe subulate; sepals caudate-acuminate-------------------43. **MACRADENIA.**
    - t. Lip simple, trulliform; sepals acute----44. **NOTYLIA.**
23. Rostellum not erect and conspicuous; anther not erect and parallel to the rostellum.
    - u. Flower with a distinct spur or sac.
      - 24. Lateral sepals free; perianth parts spreading. 45. **TRICHOCENTRUM.**
      - 24. Lateral sepals more or less connate; perianth parts connivent or not widely spreading.
        - v. Lip prominently spurred with a solid horn; lateral sepals connate nearly to the apex, forming a spreading arcuate sac at base. 46. **RODRIGUEZIA.**
        - v. Lip not spurred; lateral sepals connate near the base, forming a short sac------47. **IONOPSIS.**
    - u. Flower without a spur or sac.
      - 25. Lateral sepals not arcuate-reflexed; lip without a large transverse many-toothed callus at the base.
        - w. Lip rolled around the column and grown to it at the base-----------------48. **TRICHOPILIA.**
        - w. Lip not rolled around the column, widely spreading.
          - 26. Lip inserted on the column near the middle. 49. **ASPASIA.**
          - 26. Lip inserted at the base of the column.
            - x. Rostellum and anther drawn out into a long beak; leaves always equitant. 50. **ORNITHOCEPHALUS.**
            - x. Rostellum not or only shortly beaked; leaves (except in *Oncidium pusillum* and *Lockhartia*) normal and flat.
              - 27. Sepals and petals very long-caudate; lip undivided, long-attenuated above. 51. **BRASSIA.**
              - 27. Sepals and petals not long-caudate; lip more or less sharply 3-lobed, not long-attenuated.
                - y. Stems dwarf or pseudobulbous; leaves (except in *Oncidium pusillum*) not equitant.

28. Lip 3-lobed, with a several to many-toothed crest at the base.
52. ONCIDIUM.
28. Lip simple, retuse, with a bilobed pandurate callus. Column with 2 narrow stelidia in the middle.
53. LEOCHILUS.
y. Stems elongate, densely leaved; leaves equitant, triangular or triangular-lanceolate..............**54. LOCKHARTIA.**
25. Lateral sepals arcuate-reflexed; lip with a large transverse many-toothed callus at the base; flower solitary.............**55. CHONDRORRHYNCHA.**
12. Main axis growing on year after year, not produced into distinct annual members.
z. Leaves linear; flower solitary, axillary..........**56. DICHAEA.**
z. Leaves elliptic to oblong; flowers in dense racemes which are commonly opposite the leaves.....**57. CAMPYLOCENTRUM.**

1. **SELENIPEDIUM** Reichenb. f.

Selenipedium chica Reichenb. f. is the only Central American member of this small genus. It is a terrestrial species 10 to 15 feet high. Its slender leafy stem bears at the summit a many-flowered raceme in which the salmon-red flowers open in succession. The blooms last for only a short time. The conspicuous part of the flower is the slipper-shaped lip. The long cylindrical fruit is said to have been highly esteemed as an aromatic by the inhabitants of the Isthmus, and was used for all purposes for which real vanilla is commonly used. A vernacular name for the plant is "vainilla chica," or little vanilla, in allusion to the small vanilla-scented capsules. By the mountain Indians this species is said to be known as "vainilla en árbol." In recent years *S. chica* has been collected only on Ancón Hill (1917) and on hills east of Panama City. (Fig. 1.)

2. **HABENARIA** Willd.

Labellum simple or with a pair of short (never filiform) lobes at the base; petals simple or merely angled at base or apex.
  Ovary sharply and conspicuously 6-winged; petals lanceolate, tapering above.
1. H. alata Hook.
  Ovary merely striate-angulate; petals cuneate to broadly flabellate, dilated above.
    Labellum with a pair of triangular or lanceolate-triangular lobules near the base; petals transverse and very broadly flabellate, above consisting of two widely divergent angles............**2. H. avicula** Schlechter.
    Labellum merely angled at the base; petals cuneate, above abruptly truncate.
      Petals merely retuse..............................**3. H. petalodes** Lindl.
      Petals retuse and bluntly apiculate.
3a. H. petalodes var. micrantha Reichenb. f.
Labellum tripartite, the divisions linear or filiform; petals clearly bipartite.
  Raceme slender, 1.5 to 2 cm. in diameter; spur short, about 1 cm. long.
4. H. repens Nutt.
  Raceme stout, 3 cm. or more in diameter; spur relatively long, usually exceeding 3 cm. in length.........................**5. H. bicornis** Lindl.

(1) *Habenaria alata* is clearly distinguished by its prominently 6-winged ovary. It extends from the West Indies and Mexico through Central America to Vene-

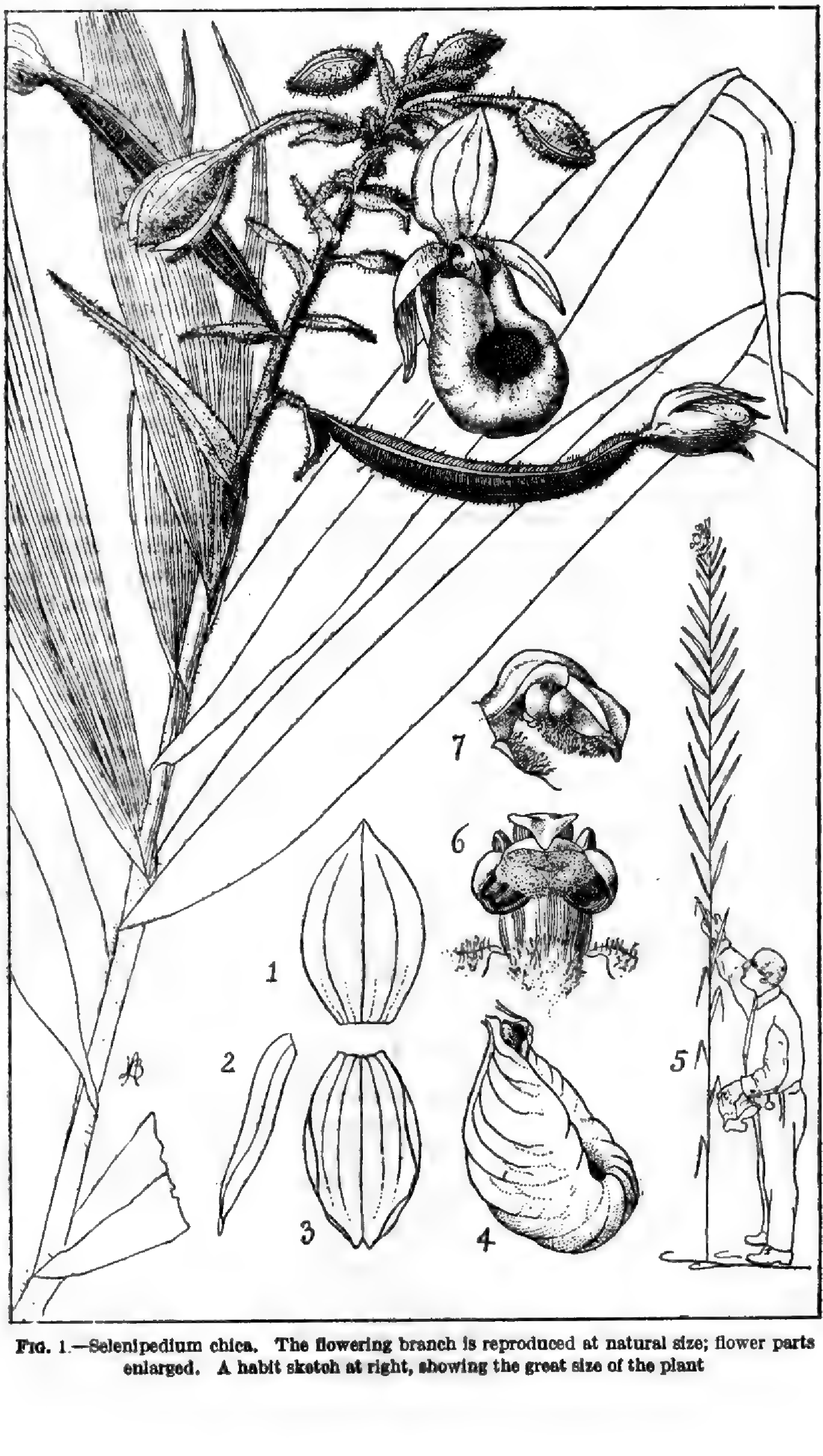

Fig. 1.—Selenipedium chica. The flowering branch is reproduced at natural size; flower parts enlarged. A habit sketch at right, showing the great size of the plant

zuela and Bolivia. In Panama it has been collected at Ana Lago, at Chiva-Chiva, and on McComber Hill near Corozal. (2) *H. avicula* is apparently confined to Panama, where it grows among the foothills east of Panama City, at Las Cascadas Plantation near Summit, and in the Orange River Valley. It is distinguished by its transverse flabellate petals and by the pair of short triangular-lanceolate lobules at the base of the lip. (3) *H. petalodes*, originally collected in Brazil, is widely distributed in Panama, having been found at many places near Balboa and Panama City, at Ceiba Tierra, near Tapia, Juan Díaz Range, and Taboga Island. The distinguishing marks are its wedge-shaped petals and the lip, which is merely angled at the base. The var. *micrantha* has smaller flowers and retuse and apiculate petals. (4) *H. repens* is characterized by its slender, rather dense raceme of greenish flowers with deeply 3-parted lip and small spur. It is very widely diffused, extending from Virginia and Alabama in the United States to the West Indies, Brazil, and Bolivia. In Panama it has been found only on floating islands and logs in Gatún Lake, in Gigante Bay, and near Frijoles. (5) *H. bicornis*, found at Las Sabanas and near Pacora, is also a native of Cuba. It has a broad raceme of green and white flowers with a 3-parted lip and an elongate spur.

3. VANILLA Swartz. VANILLA

Sepals and petals about 5 cm. long; lamina of lip with crenulate-verrucose veins. 1. **V. fragrans** (Salisb.) Ames.

Sepals and petals 7.5 cm. or more long; lamina of lip without verrucose veins. 2. **V. pompona** Schiede.

Two species occur in Panama, *V. fragrans* (more generally known as *V. planifolia* Andr.) and *V. pompona*. (1) *V. fragrans* (pl. 20) is native in southeastern Mexico and extends from there through Central America and South America. It is cultivated in the West Indies, Java, Tahiti, and the Mascarene Islands. In Panama it is reported from the Río Tecumen and various localities near Panama City. (2) *V. pompona* is somewhat more widely distributed than *V. fragrans*. It extends from southeastern Mexico through Central America to Colombia, Brazil, Ecuador, and Bolivia, and is cultivated in the West Indies. In Panama it is found on the Río Tapia and near Panama City. It is the Grosse Vanille of Aublet, Baynilla de acguales of Humboldt, and the Baynilla Pompona of Schiede. Although not now an important source of commercial vanilla, its fruits, under the name of "vanillons," were once a well-known tropical product, and may have furnished the "vanilloes" mentioned by James Petiver in 1693 as an imperfectly known and "most earnestly desired" article of commerce.

4. ROLFEA Zahlbr.

Until recently the genus *Rolfea* was represented by only one species, a native of Trinidad and British Guiana, but in 1923 another species was found at Juan Díaz near Panama City. *Rolfea powellii* Ames (fig. 2) is a terrestrial herb with lanceolate-elliptic leaves and lateral and terminal, short racemes of small, creamy white flowers.

5. CLEISTES L. Rich.

Cleistes rosea Lindl. is the only Central American representative of this genus. It is a rather tall terrestrial bearing a few scattering oblong-lanceolate leaves and 1 to 3 large axillary flowers of a rose-purple color with a simple lip. In Panama this species occurs on the Río Tecumen and in the foothills east of Panama City. (Fig. 3.)

6. ELLEANTHUS Presl

Leaves linear; inflorescence a dense head subequally long and broad.
1. E. linifolius Presl.
Leaves lanceolate; inflorescence a dense raceme, distinctly longer than broad.
2. E. trilobatus Ames & Schweinf.

(1) *Elleanthus linifolius* has linear leaves and nearly spherical flower heads. It has been collected only on the Catival-Porto Bello Trail. (2) ***E. trilobatus***, which has been found only in Costa Rica and Panama, is a larger plant than *E. linifolius*, with lanceolate plaited leaves and long racemes. It grows in the hills east of Panama City, in the Canal Zone around Culebra, at San Juan on the upper Chagres River, and near Porto Bello. This species has been confused with the Costa Rican *E. brenesii*. (Fig. 4.)

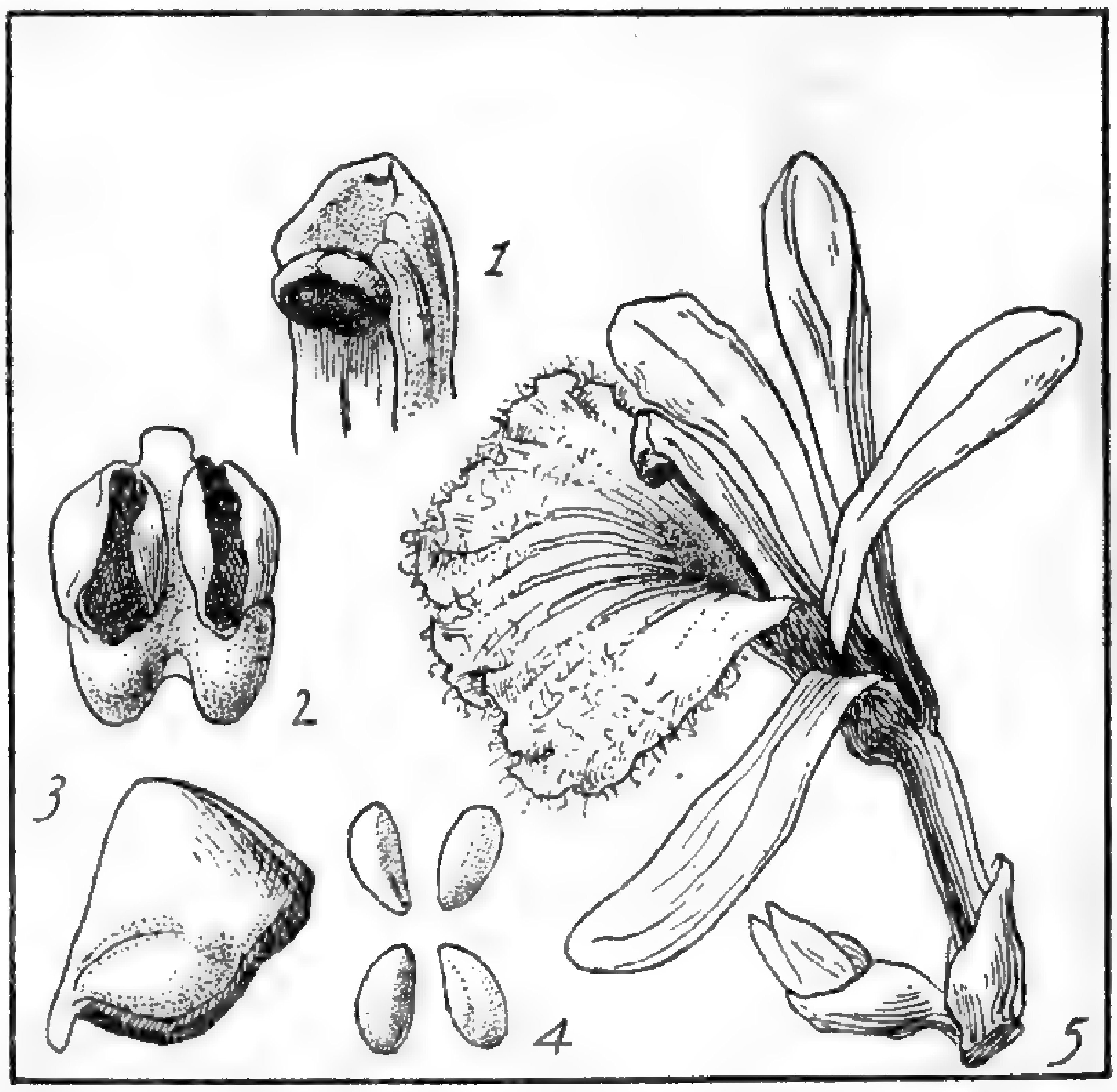

Fig. 2.—Rolfea powellii. The flower is twice natural size. The details are enlarged

7. SOBRALIA Ruiz & Pav.

Labellum simple or very nearly so.
  Stems ancipitous; labellum with nine fringed keels throughout the length; leaves one or two………………………………**1. S. fragrans** Lindl.
  Stems subterete; labellum provided only with a pair of short smooth keels at the base; leaves usually three to numerous.
    Base of flower with one or more glabrous leaflike spathes; stem not pustulose; flower cream-yellow…………**2. S. macrophylla** Reichenb. f.
    Base of flower enveloped by two or more black-pubescent sheathlike spathes; stem or leaf sheaths densely pustulose, at least above; flower bright purple-red or white.
      Stems and leaf sheaths entirely black-pubescent; labellum merely obtuse.
        Flower bright purple-red within, white without; labellum dark purple-red in the throat……………**3. S. panamensis** Schlechter.
        Flower white; labellum lemon-yellow at base.
        3a. S. panamensis var. albiflos Schlechter.

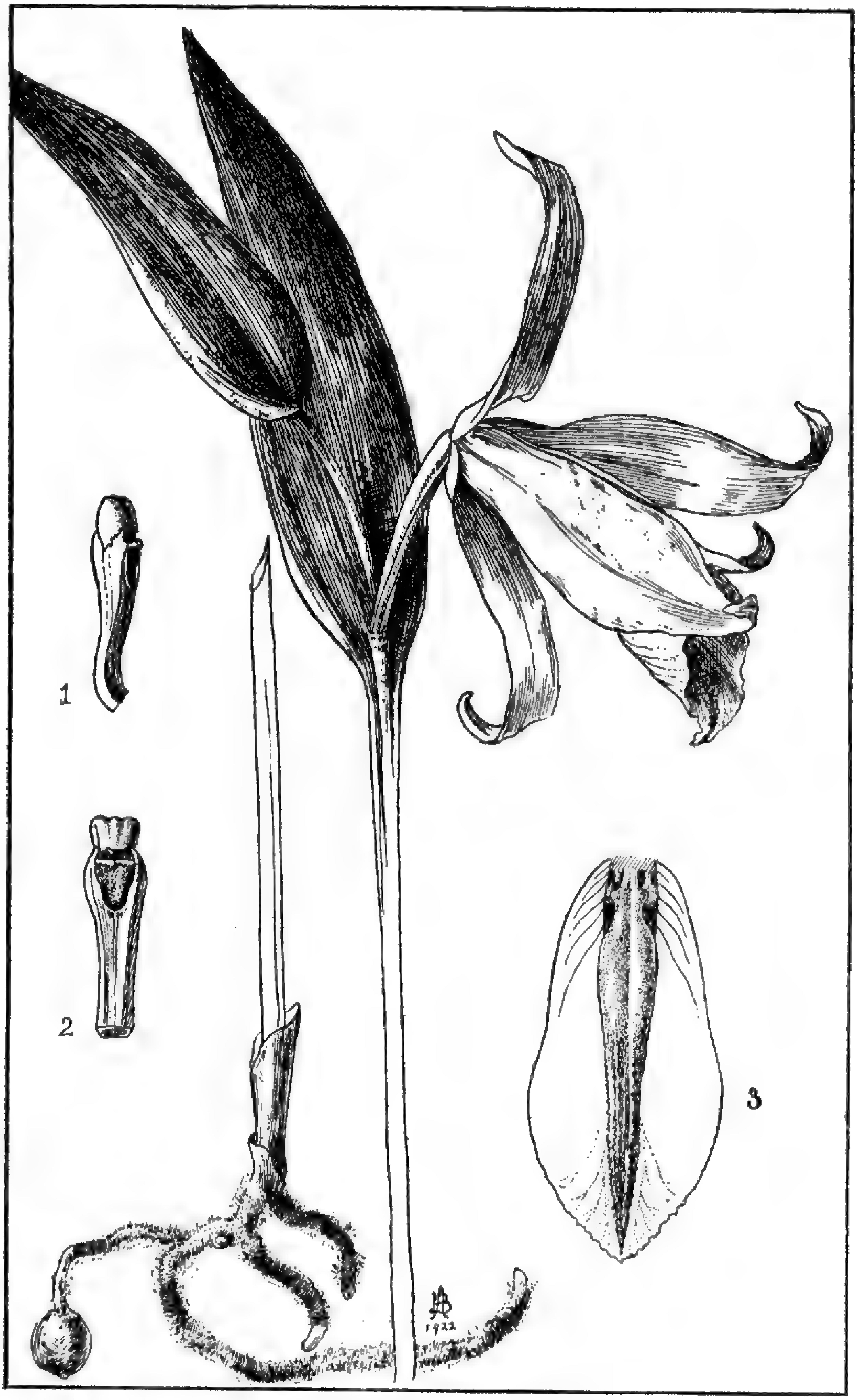

FIG. 3.—Cleistes rosea. Natural size

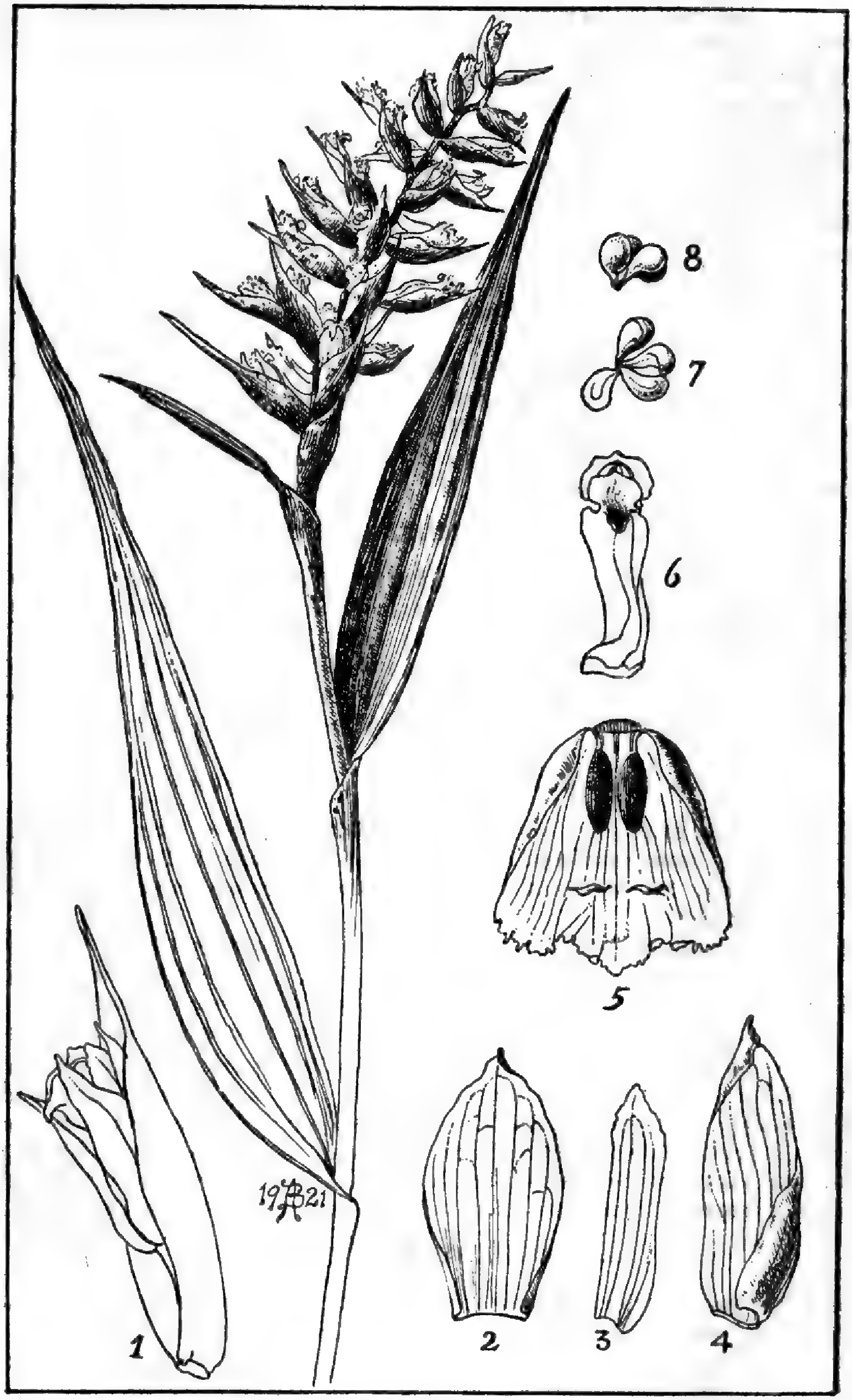
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FIG. 4.—Elleanthus trilobatus. The plant is reproduced at natural size. The flower parts are enlarged

Stems and leaf sheaths glabrous for the most part; labellum retuse at the apex; flowers white, the labellum with a brownish yellow throat bordered with cherry-red .... **4. S. powellii** Schlechter.

Labellum sharply 3-lobed near the apex .... **5. S. suaveolens** Reichenb. f.

(1) *Sobralia fragrans*, bearing one or two leaves, has flattened stems and relatively small flowers. These have a lip with fringed veins. It ranges from Guatemala to Colombia. Hills east of Panama City. (2) *S. macrophylla*, with solitary large yellowish flowers, ranges from Costa Rica to Brazil. In Panama it grows at Miraflores and in the foothills near Panama City. (3) *S. panamensis*, which may prove identical with *S. decora* Batem., is confined to Panama, being found at Ana Lago, on Barro Colorado Island in Gatún Lake, at Juan Díaz, Las Cruces, and San Juan, and in the hills east of Panama City. It has uniformly fine-hairy stems and leaf sheaths and solitary flowers which are purple-red with white backs. The var. *albiflos* has white flowers. (4) *S. powellii*, of the Gatún Lake region, lacks the general fine-hairy character and has large solitary milk-white flowers. (5) *S. suaveolens* is distinguished by a cluster of small creamy flowers which have a 3-lobed lip. Originally found at Colón, this species grows also on the Río Indio de Gatún, at Chiva Chiva, around Culebra, and in the foothills east of Panama City.

8. PONTHIEVA R. Br.

The genus *Ponthieva* is represented in Panama by the widespread *P. racemosa* (Walt.) Mohr, which extends from Virginia in the United States to the West Indies and Central America. Specimens have been found in the San Juan Range, east of Panama City. The leaves are elliptic, obovate, or oblanceolate, in a basal rosette, and the flowers, which are borne in a loose terminal raceme, are remarkable in having the triangular petals and concave lip inserted on the column.

9. SPIRANTHES L. Rich. LADIES-TRESSES

Plant commonly epiphytic; leaves present at flowering time; terminal lobe of lip subequally broad with basal half .... **1. S. prasophyllum** Reichenb. f.

Plant terrestrial; leaves absent at flowering time; terminal lobe of lip small or inconspicuous.

  Flowers minute, the sepals 2 mm. long; lip very sharply 3-lobed near apex. **2. S. guyanensis** Cogn.

  Flowers larger, the sepals 4.5 mm. long; lip lightly subpandurate near the apex .... **3. S. subpandurata** Ames & Schweinf.

(1) *Spiranthes prasophyllum* is usually epiphytic. It extends from Guatemala to the Río Indio de Gatún in the Canal Zone. (2) *S. guyanensis* of Trinidad, British Guiana, and Surinam has been collected once at Monte Lirio in the Canal Zone. It has minute flowers with an ovate, sharply 3-lobed lip. (3) *S. subpandurata* has larger flowers than *S. guyanensis*, with a lanceolate subpandurate lip. It is recorded from Costa Rica and from the upper Chagres River.

10. STENORRHYNCHUS L. Rich.

Stenorrhynchus orchioides (Swartz) L. Rich. occurs in various places in Panama: Bella Vista (near Panama City), Ceiba Tierra, Mata Redonda, Monte Lirio, La Chorrera, Tecumen, Tapia, near Gatún, Mt. McComber, and near Pacora. This widespread species extends from Florida and Mexico through Central America and the West Indies to Brazil, Peru, and Ecuador.

11. SARCOGLOTTIS Presl

In Panama the only species is the widespread *Sarcoglottis picta* (Anders.) Klotzsch. Its range extends from Salvador and Costa Rica to Tobago, Trinidad, and Brazil. The numerous Panamanian records include San Juan, upper reaches of Chagres River, foothills and swamps east of Panama City, Juan Díaz, around Culebra, Manteca, and Mata Redonda.

12. LIPARIS L. Rich.

Of this cosmopolitan genus, there is but one representative in Panama, the widespread *Liparis elata* Lindl. C. W. Powell has found it in flats east of Panama City and at Ceiba Tierra. Elsewhere it extends from Florida and Mexico through the West Indies and Central America to Brazil and Bolivia. It is a large plant for the genus, with a basal cluster of elliptical membranaceous leaves and an erect raceme of small, green and purple, or reddish flowers.

13. CRYPTOPHORANTHUS Rodr.

Panama has but one representative of the genus. *Cryptophoranthus powellii* Ames is localized in the foothills east of Panama City and at San Juan. It is a little plant with a single elliptical leaf at the summit of the short stem. The axillary flowers are dark blood-red.

14. MASDEVALLIA Ruiz & Pav.

Masdevallia livingstoneana Roezl & Reichenb. f. is the only representative of the genus found in Panama. It has been collected near the village of Arraiján, along the Río Indio de Gatún, in the foothills east of Panama City, and at San Juan on the upper Chagres River. It is a small plant with minute stems crowned with one spatulate leaf and with solitary long-stemmed flowers. The color of the blossoms is commonly yellow with maroon blotches, rarely white with lemon-yellow throat. (Fig. 5.)

15. STELIS Swartz

Sepals very unequal; dorsal sepal more than twice longer than the lateral sepals, the latter connate nearly to the apex............ 1. **S. inaequalis** Ames.
Sepals about equal, all free above the middle.
  Flowers relatively large for the genus; sepals 3 mm. or more long from the base.. 2. **S. williamsii** Ames.
  Flowers small to minute; sepals 2 mm. long or less from the base to apex.
    Labellum ovate, distinctly longer than broad, with a blunt triangular concave apex........................ 3. **S. crescentiicola** Schlechter.
    Labellum rhombic-ovate, distinctly broader than long, with the fleshy calli sloping to the apex........................... 4. **S. gracilis** Ames.

(1) *Stelis inaequalis* is the smallest plant of the region. It was found in the foothills on the upper reaches of the Chagres River near San Juan. (2) *S. williamsii* grows in the foothills near Panama City. It was originally found at Cana. (3) *S. crescentiicola* is remarkable for its long arching raceme of minute flowers. It occurrs on the Río Chagres, at San Juan, in the foothills east of Panama City, near Arraiján west of the Canal Zone, and also in Costa Rica. (4) *S. gracilis* is a more widely diffused plant, extending from Guatemala south through Costa Rica and Honduras to Panama, where it was found on the upper Mamoni River.

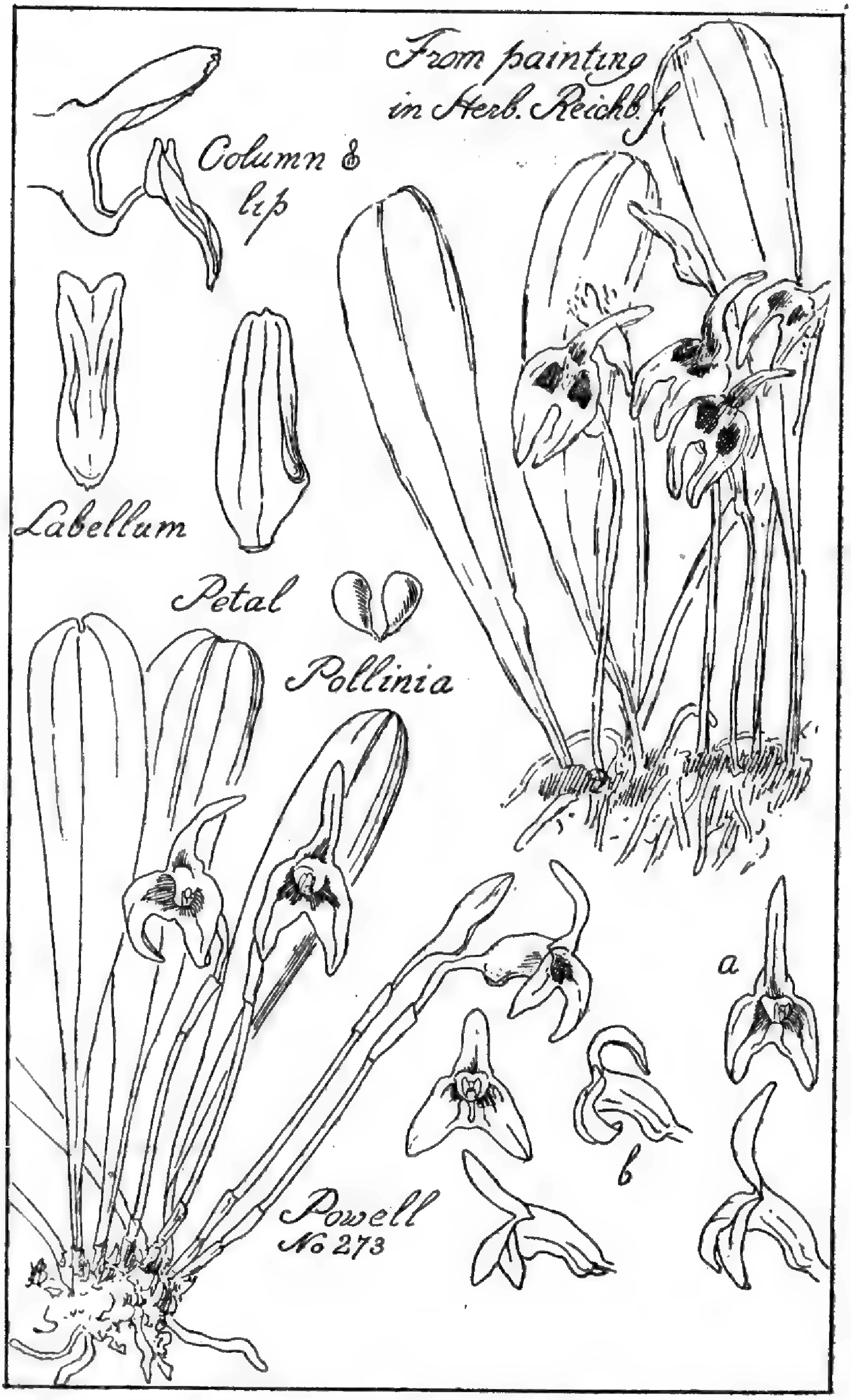
From painting in Herb. Reichb. f.
Column & lip
Labellum
Petal
Pollinia
a
b
Powell No 273

FIG. 5.—Masdevallia livingstoneana. The plants are drawn natural size. The flower parts in the upper left are enlarged. The plant in the upper right is reproduced from a colored sketch in the Reichenbach herbarium

16. PLEUROTHALLIS R. Br.

Leaf deeply cordate; lamina broadly ovate........1. **P. rhodoglossa** Schlechter.
Leaf cuneate at base; lamina not broadly ovate.
  Inflorescence abbreviated, axillary, 1-flowered.
    2. **P. trachychlamys** Schlechter.
  Inflorescence on a long slender peduncle.
    Leaf obovate to suborbicular....................3. **P. marginata** Lindl.
    Leaf elliptic-lanceolate, oblanceolate or linear.
      Stems well developed, 4 to 19 cm. long; petals irregularly denticulate at the apex..............................4. **P. verecunda** Schlechter.
      Stems abbreviated, 1.2 cm. or less; petals entire at the apex.
        Leaf linear-oblong; peduncle densely fine-pubescent.
          5. **P. glandulosa** Ames.
        Leaf oblanceolate or spatulate; peduncle glabrous.
          Flowers springing from a cluster of imbricated bracts, usually fascicled..............................6. **P. brighamii** S. Wats.
          Flowers not subtended by a cluster of bracts, always one or two.
            7. **P. barboselloides** Schlechter.

(1) *Pleurothallis rhodoglossa* is said to come from the hills near Panama City. (2) *P. trachychlamys* is confined to the foothills east of Panama City. (3) *P. marginata* extends from Mexico through Central America. In Panama it is recorded from trees in Gatún Lake, on Barro Colorado Island in Gatún Lake, on hills north of Frijoles, at Juan Grande, on hills near Panama City, and on the Río Indio de Fató. (4) *P. verecunda* is similar in habit to *P. trachychlamys*. The locality for the typical plant is the hills east of Panama City, and a large form occurs on the Río Indio near the mouth of the Chagres River. (5) *P. glandulosa*, a very small, tufted plant, is found on the Juan Grande Range and at San Juan. (6) *P. brighamii* is found in Guatemala, Honduras, and Panama, where it occurs in the foothills east of Panama City, at Frijoles on the banks of Gatún Lake, on Barro Colorado Island, at Casa Ladre, and at San Juan. (7) *P. barboselloides* is recorded only from hills near or east of Panama City.

17. OCTOMERIA R. Br.

This genus is represented in Panama by a single species, *Octomeria costaricensis* Schlechter. It ranges from Costa Rica to the Catival-Porto Bello Trail in Panama. It is a tufted plant with prominent stems bearing a single narrowly elliptic leaf and axillary clusters of short 1-flowered inflorescences.

18. HEXISEA Lindl.

In the region of the Panama Canal there is a single species, *Hexisea oppositifolia* Reichenb. f., from the San Juan Hills east of Panama City. It has oblong or linear leaves.

19. SCAPHYGLOTTIS Poepp. & Endl.

Column with a pair of distinct arms above the middle or near the summit.
  Lip sharply 3-lobed near the apex with angled sinuses.
    1. **S. amethystina** (Reichenb. f.) Schlechter.
  Lip not sharply 3-lobed.
    Lamina of lip pandurate above, i. e. subequally dilated in the middle and near the apex; column arms subulate, much below the stigmatic orifice.......2. **S. mesocopis** (Endr. & Reichenb. f.) Benth. & Hook. f.
    Lamina of lip not pandurate above; column arms short, triangular-lanceolate.

Leaves elongate, up to 20 cm. long, 3 to 4 mm. wide; lip constricted above the middle to form a quadrate-truncate terminal lobe.
3. **S. dolichophylla Schlechter.**

Leaves relatively short, up to 6 cm. long, 3 to 7.5 mm. wide; lip simple and without marked constriction............4. **S. laevilabia Ames.**

Column without arms above.

Lip sharply 3-lobed at the truncate apex with subequal lobes.
5. **S. unguiculata Schlechter.**

Lip not sharply 3-lobed at the apex.

Pedicellate ovary conspicuously exserted beyond the floral bracts; lip lightly 3-lobed above the middle, with a transverse fold on each side.
6. **S. behrii** (Reichenb. f.) Benth. & Hook. f.

Pedicellate ovary concealed by the floral bracts; lip undulate, 3 or 4-lobulate at the apex, with flat margins.............7. **S. wercklei** Schlechter.

(1) *Scaphyglottis amethystina* has stout stems and a sharply 3-lobed lip. The column is provided with distinct arms. Widely distributed in Costa Rica and Chiriquí. It is found in Panama on the upper reaches of the Chagres River. (2) *S. mesocopis* grows in Costa Rica and locally in the hills east of Panama City. The flower has a pandurate lip. (3) *S. dolichophylla* is characterized by elongate linear leaves. The lip is only slightly constricted near the apex. The species is confined to the hills east of Panama City. (4) *S. laevilabia* is closely allied to *S. dolichophylla* but has relatively short leaves and a lip which is not noticeably constricted. It occurs near Juan Díaz, in the hills at San Juan, and in the foothills east of Panama City. (5) *S. unguiculata*, a species which is confined to Costa Rica and Panama, is a slender plant with long-stalked flowers in which the lip is sharply 3-lobed at the dilated apex. It is localized in the foothills east of Panama City, in the hills north of Frijoles, and at Loma de la Gloria near Fató, Province of Colón. (6) *S. behrii* is apparently a widely distributed and variable plant in Panama. Originally discovered at Chagres, it has recently been found on the San Juan Range, the Juan Díaz Range, on hills near Frijoles, at La Pita, and McComber Hill. It is clearly distinguished from its allies by the transverse fold on each side of the indistinctly 3-lobed lip and by the conspicuous ovaries. (7) *S. wercklei*, a species originally discovered in Costa Rica, was found by C. W. Powell on the San Juan Range in Panama. It is separated from *S. behrii* by shorter, more spreading leaves, by the ovary being concealed by bracts, and by the absence of folds on the lip, which is lightly 3 or 4-lobed at the tip. In aspect it is similar to *S. laevilabia* but is clearly distinguished by the lip characters and by the absence of column arms.

20. POLYSTACHYA Hook.

Ovary densely pubescent; mid-lobe of lip suborbicular; plant commonly dwarf.
1. **P. masayensis** Reichenb. f.

Ovary glabrous; mid-lobe of lip subquadrate, truncate; plant commonly tall.
2. **P. minor** Fawc. & Rendle.

(1) *Polystachya masayensis* of Nicaragua and Costa Rica occurs at Chagres and between the Canal Zone and Catival, Province of Colón, and at France Field, on the Catival-Porto Bello Trail. (2) *P. minor* is a widely distributed plant, extending from the West Indies and Mexico through Central America. In Panama it occurs on hills east of Panama City, on Ancón Hill, and on the old Las Cruces Trail between Fort Clayton and Corozal.

21. DIACRIUM Lindl.

Diacrium bilamellatum (Reichenb. f.) Hemsl., the only species occurring in Panama, is found east of Panama City and is said to be common along the Pacific coast of Panama. C. W. Powell says that this species opens its flowers in succession.

22. EPIDENDRUM L.

Plant with true pseudobulbs or with fusiform-thickened stems and leaves borne at their summit.
  Column adnate to the labellum only at the very base.
    Labellum entire..........1. **E. ottonis** Reichenb. f.
    Labellum 3-lobed, with the middle lobe much the largest.
      Middle lobe of labellum emarginate or bilobed, 2 to 3.5 cm. long; column exauriculate near the clinandrium.....2. **E. atropurpureum** Willd.
      Middle lobe of labellum broadly rounded or obtuse, 1.2 cm. long or less; column auriculate on each side near the clinandrium.
        Flower when spread 2 to 2.5 cm. broad; mid-lobe of labellum not verrucose..........3. **E. amandum** Ames.
        Flower when spread 4 cm. or more broad; mid-lobe of labellum verrucose near the apex..........4. **E. alatum** Batem.
  Column distinctly adnate to the labellum for at least half its length.
    Inflorescence lateral; labellum 3-lobed.
      Inflorescence spicate, 13.5 cm. long or less; mid-lobe of labellum simple. 5. **E. rousseauae** Schlechter.
      Inflorescence usually paniculate, 30 cm. or more long; mid-lobe of labellum bilobed and lacerate-dentate..........6. **E. stamfordianum** Batem.
    Inflorescence terminal; labellum simple.
      Pseudobulbs 1-leaved.
        Leaf narrowly linear; flowers small, about 1.1 cm. broad when spread out..........7. **E. glandulosum** Ames.
        Leaf oblong to narrowly elliptic; flowers large, 3 to 5.5 cm. broad when spread out..........8. **E. fragrans** Swartz.
      Pseudobulbs 2 or more-leaved.
        Column extending at most one-third the way up the lamina of the labellum; sepals and petals not spotted; lip commonly with dark stripes..........9. **E. ionophlebium** Reichenb. f.
        Column extending at least halfway up the lamina of the labellum; sepals and petals dark-spotted..........10. **E. variegatum** Hook.
Plant without true pseudobulbs, the leaves distributed along the stem.
  Column nearly free from the labellum (adnate only at very base). 11. **E. stenopetalum** Hook.
  Column adnate to the lip nearly to its tip.
    Leaves equitant..........12. **E. equitantifolium** Ames.
    Leaves not equitant.
      Peduncle below the inflorescence usually elongated and much longer than the flower cluster.
        Petals broader than the sepals; flowers entirely rose-purple or rose-pink..........13. **E. imatophyllum** Lindl.
        Petals much narrower than the sepals, spatulate-filiform; sepals and petals not rose-purple.
          Leaves rounded or rarely acute at the apex; mid-lobe of lip subquadrate, porrect and shallowly bilobed..........14. **E. anceps** Jacq.

Leaves long-acuminate above; mid-lobe of lip divided into linear-falcate, transversely spreading lobules.
15. **E. turialvae** Reichenb. f.

Peduncle below the inflorescence short, not equaling the flower cluster.

Flowers one to rarely three (in *E. sculptum*), sessile or nearly so.

Lip simple; plant dwarf.

Leaf sheath about twice the length of the internodes, the leaves in consequence close together; lateral sepals with a high dorsal keel .... 16. **E. schlechterianum** Ames.

Leaf sheaths about equaling the internodes, the leaves in consequence separated from one another; lateral sepals ecarinate.
17. **E. porpax** Reichenb. f.

Lip 3-lobed.

Leaves ascending; mid-lobe of lip subulate.
18. **E. nocturnum** Jacq.

Leaves horizontally spreading or reflexed; mid-lobe of lip lanceolate.
19. **E. sculptum** Reichenb. f.

Flowers three or usually more (rarely only two in depauperate inflorescences), pedicellate.

Inflorescence subumbellate; flowers long-pedicellate; stems sparingly if at all branched.

Leaf sheaths large and flaring, the folded sheath 2 cm. wide at junction with leaf; labellum simple, suborbicular.
20. **E. hunterianum** Schlechter.

Leaf sheaths not large and flaring, rather closely appressed; labellum broadly reniform in outline, more or less lobulate at the apex.

Petals obtuse; labellum nearly four times broader than long. (The author has not seen any authentic material of this species from Panama and he entertains the same doubts expressed by Lindley, who described the species, as to its specific distinctness from *E. difforme* Jacq.)
21. **E. latilabrum** Lindl.

Petals acute; labellum about two or three times as broad as long .... 22. **E. difforme** Jacq.

Inflorescence not subumbellate, either racemose or paniculate.

Inflorescence paniculate; mid-lobe of lip consisting of a pair of linear, retrorsely falcate lobules. (The material of *E. floribundum* from the Canal Zone which we have seen represents *E. isthmii* Schltr. [Repert. Sp. Nov. Fedde Beih. 17: 34. 1922] with less spreading, somewhat lacerate-denticulate lobes of the lip) .... 23. **E. floribundum** H. B. K.

Inflorescence racemose; mid-lobe of lip (if the latter is 3-lobed) not consisting of narrow retrorse lobules.

Lip simple, or if 3-lobulate the lobelike portion at the apex.

Flower large, 4 cm. or more wide when spread out; plant cespitose, the stems simple.
24. **E. eburneum** Reichenb. f.

Flower small, 1.9 cm. or less wide when spread out; plant usually much branched or with a long creeping rhizome.

Rhizome abbreviated; stems branched; lip ovate-triangular.
25. **E. strobiliferum** Reichenb. f.

Rhizome long-creeping; stems simple; lip cordate-reniform to suborbicular .... 26. **E. rigidum** Jacq.

Lip 3-lobed, with distinct broad basal and apical divisions.
  Leaves lorate; inflorescence dense; petals broader than the sepals..................13. **E. imatophyllum** Lindl.
  Leaves elliptic or elliptic-oblong; inflorescence lax; petals narrower than the sepals..27. **E. subpatens** Schlechter.

(1.) *Epidendrum ottonis* is found in Venezuela, the West Indies, and Panama, where it occurs on hills east of Panama City and between Las Sabanas and the Río Tecumen. (2.) *E. atropurpureum*, including its numerous varieties, extends from the West Indies and Mexico through Central America and much of northern South America. It is found at San Juan, between the Tapia and Tecumen Rivers, and at Penonomé, and is said to be common along the Pacific coast of Panama. (3.) *E. amandum* is found only in the foothills east of Panama City and at San Juan. It has clusters of small pear-shaped pseudobulbs bearing one or two linear leaves. (4.) *E. alatum* of Guatemala, Honduras, and Nicaragua has been reported from hills behind Culebra. (5.) *E. rousseauae* is confined to Panama, where it grows on hills east of Panama City, and on Barro Colorado Island in Gatún Lake. (6.) *E. stamfordianum* extends from Mexico to northern South America. It occurs at many places in the Canal Zone and is said to be very common on the Pacific side of the Isthmus of Panama. (7.) *E. glandulosum* has lately been found in Costa Rica. The typical Panama plant comes from the Catival-Porto Bello Trail near Colón. (8.) *E. fragrans* is a widespread species extending from Guatemala and the West Indies through Central America and northern South America. It is found at San Juan and Frijoles and is said to occur generally in the foothills in the Republic of Panama. (9.) *E. ionophlebium* extends from Guatemala to Panama, where it occurs at San Juan, on the upper Chagres River, near Frijoles, and in the foothills near Panama City. (10.) *E. variegatum* is an extremely variable plant. From Cuba and Costa Rica it extends south throughout most of northern South America. The single record from Panama is the Hospital Grounds at Ancón, where the plant was in cultivation. (11.) *E. stenopetalum* has a wide range, from Jamaica and Mexico south to northern South America. In Panama it occurs between France Field and Catival; on the old Las Cruces Trail between Fort Clayton and Corozal; at Las Cascadas Plantation near Summit; on the San Juan Range and hills east of Panama City; and on Barro Colorado Island. (12.) *E. equitantifolium* occurs in Martinique and extends from Mexico south to Panama, where it grows on hills east of Panama City. (13.) *E. imatophyllum* ranges from Mexico southward through Central America and northern South America, commonly, if not always, in ant nests. In Panama it occurs at Las Cascadas, at Sabana de Panama, and in foothills near Panama City. (14.) *E. anceps* is another variable plant. It extends from Florida, the West Indies, and Mexico, southward through Central America and northern South America. Its stations in Panama are the Gatún Lake region, San Juan, and on the Fort Sherman and Chagres mouth Trail. C. W. Powell says that this plant grows high up in the trees where moisture is plentiful below. (15.) *E. turialvae*, from Costa Rica and Panama, is a tall graceful plant. In Panama it is found on the Río Indio near the mouth of the Chagres River. (16.) *E. schlechterianum* (fig. 6) is known only from type locality, hills near Panama. (17.) *E. porpax* is found in Costa Rica and in Panama, where C. W. Powell collected it on foothills east of Panama City. (18.) *E. nocturnum* ranges from Florida, the West Indies, and Mexico southward through Central America and the northern part of South America. The var. *panamense* was set apart because of its more slender habit and smaller flowers. In Panama it occurs widely in the Gatún Lake region, at La Chorrera, Paja, and San Juan, and on hills east of Panama City. (19.) *E. sculptum* has a limited range: Panama, Colombia, Surinam. It was found on dead trees in Gatún Lake, at San Juan, on the old Las Cruces Trail between Fort Clayton and Corozal, and on the Río Indio de Fató. (20.) *E. hunterianum* comes from the region of Gatún Lake. The flowers are greenish. (21.) *E. latilabrum* has been reported from the inundated territory of Gatún Lake and from various places near Panama City. No authentic material from Panama has been seen. It is also reported from Dominica, Costa Rica, French Guiana, Brazil, and Peru. (22.) *E. difforme* is another widespread species, extending from Florida, the West Indies, and Mexico southward through Central America and northern South America. An extremely variable plant. In Panama it is found in the Gatún Lake region, at San Juan and Paja, and in the foothills east of Panama City. (23.) *E. floribundum* extends from Mexico southward through Central America and most of northern South America. Only the *isthmii* form, with less spreading, somewhat toothed lobes of the lip, appears to come from Panama, where it occurs on hills east and southeast of Panama City. (24.) *E. eburneum* is confined to Panama. It occurs in the Gatún Lake region, in old swamp behind Colón, and on the Río Indio de Fató, Province of Colón. (25.) *E. strobiliferum* is a rather

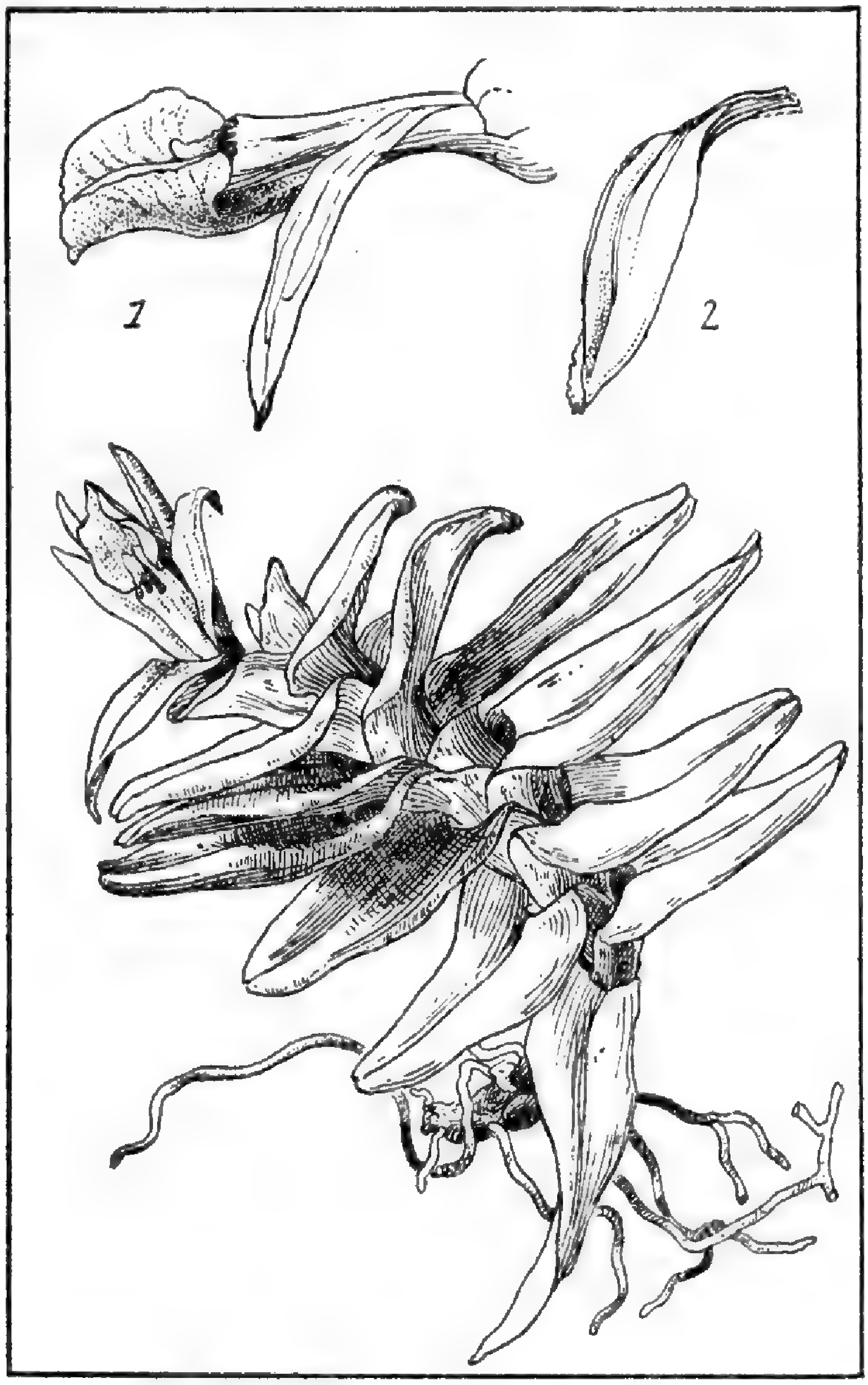

FIG. 6.—Epidendrum schlechterianum. The plant is reproduced one and one-fourth times natural size. The flower details are enlarged

widely diffused species extending from Florida, the West Indies, Guatemala, and Panama to most of northern South America. Its stations in Panama are on foothills east of Panama City, Las Cascadas Plantation near Summit, and on the San Juan Range. (26.) *E. rigidum* is a very widespread plant, found from Florida, the West Indies, and Mexico southward through Central America and northern South America. The Panama plant, found on the Catival-Porto Bello Trail, differs from the usual form in its larger flowers, which much exceed the bracts. (27.) *E. subpatens* occurs in Guatemala, Costa Rica, Veraguas, and the Gatún Lake region of Panama.

23. **CATTLEYA** Lindl.

Cattleya deckeri Klotzsch, occurring in Guatemala and Costa Rica, is the only species of *Cattleya* known to be a native of Panama. It is found along the Caño Quebrado, Canal Zone, and high up in trees on hills east of Panama City. It has 2 or 3 elliptic blunt leaves and a short raceme of flowers, small for the genus, with purple lip which lacks the light-colored throat of the allied *C. skinneri* Batem. It flowers from late September to December, and the flowers have a tendency toward self-fertilization, according to C. W. Powell.

24. **BRASSAVOLA** R. Br.

Brassavola nodosa Lindl. extends from Mexico and the West Indies through Central America and northern South America. In Panama it appears to be a common plant on both the Atlantic and Pacific coasts. It has been found on the Catival Trail and at Laja, Palo Seco, France Field, and Taboga Island. Under the synonym, *B. venosa* Lindl., H. G. Reichenbach says that this plant is highly esteemed by the inhabitants because of its natural fragrance. The vernacular name is "dama de noche."

25. **CHYSIS** Lindl.

The only species recorded from Panama is *Chysis aurea* Lindl. var. *maculata* Hook. with yellow and red flowers. It has been found near Arraiján. It is also a native of Costa Rica, Colombia, and Venezuela.

26. **LIMODORUM** L.

Limodorum tuberosum L. extends from Florida and the West Indies and Mexico southward through Central America to Panama and Venezuela. It occurs in the foothills east of Panama City, at Juan Díaz, on the Tapia River, and at Arraiján. The form designated as *Bletia purpurea* DC. var. *pittieri* Schlechter is here included under the species.

27. **EULOPHIA** R. Br.

A single species occurs in Panama, *Eulophia alta* (L.) Fawc. & Rendle, known as ground or wild coco. It extends from Florida, the West Indies, and Mexico south through Central America and northern South America and into Africa. It is found in the valleys east of Panama City and at Mata Redonda.

28. **MORMODES** Lindl.

Sepals reflexed; lip obovate, abruptly apiculate, coriaceous.
1. **M. igneum** Lindl. & Paxt.
Sepals and petals widely spreading; lip rhombic-ovate, acuminate, similar in texture to the rest of the perianth............2. **M. powellii** Schlechter.

(1.) *Mormodes igneum*, of Central America and Colombia, is apparently common in Panama, occurring on the upper Chagres River, at San Juan, in the

Gatún Lake region, in foothills east of Panama City, and at Las Cascadas Plantation. (2.) *M. powellii* is limited to Panama. It occurs on the upper Chagres River, at Ana Lago, and on trees in Gatún Lake.

29. **CATASETUM** L. Rich.

Inflorescence erect, stout; flowers large, 5 to 6 cm. across; lip wholly saccate, entire at apex..**1. C. viridiflavum** Hook.

Inflorescence pendent, relatively slender; flowers small, 3 cm. or less across; lip saccate at the base, 3-lobed, with terminal lobe deeply fimbriate. **2. C. scurra** Reichenb. f.

(1.) *Catasetum viridiflavum* is confined to Panama. It occurs at Bella Vista, on Barro Colorado Island, and is cited by C. W. Powell as very common in damp places, flowering in the rainy season. (2.) *C. scurra* occurs in British Guiana, and in Panama, where it is found on trees in Gatún Lake, at Frijoles, and in moist places between hills near Panama City.

30. **CYCNOCHES** Lindl.

But one species of this genus occurs in the region of the Panama Canal, *Cycnoches guttulatum* Schlechter. In this plant the male flowers are in long pendent racemes and have a long-clawed lip with dilated apex which is adorned with numerous fingerlike projections. The larger female flowers grow usually in pairs. This species is confined to Panama and is found on trees in Gatún Lake and in other low places, according to C. W. Powell.

31. **LYCASTE** Lindl.

Lycaste powellii Schlechter, the only species occurring in Panama, has elliptic-lanceolate leaves and brown, white, and red flowers. The records are foothills east of Panama City and Juan Grande.

32. **XYLOBIUM** Lindl.

Xylobium stachyobiorum (Reichenb. f.) Hemsl. is the only species found near the Canal Zone. It occurs in Costa Rica and Panama, being found at Ana Lago, Pulga Huevos, Chiva-Chiva, Pacora, Ceiba Tierra, and in the hills east of Panama City.

33. **PERISTERIA** Hook.

In Panama the only representative of this genus is *Peristeria elata* Hook. (pl. 22), variously called Espíritu Santo, dove orchid, or Holy-ghost-flower. The white flowers are borne in a stout erect raceme. It is said to be frequent between hills near Panama City (in undergrowth among fallen leaves). It has been found on hills near Juan Díaz, and on Barro Colorado Island in Gatún Lake. Records exist of its occurrence also in Colombia and Venezuela.

34. **SIEVEKINGIA** Reichenb. f.

Sievekingia suavis Reichenb. f., the only species in Panama, has pendent racemes of membranaceous yellowish flowers with connivent sepals and petals and a simple, ovate, deeply concave lip. This species, until recently known only from Costa Rica, has been found on the Catival-Porto Bello Trail in Panama.

35. **CORYANTHES** Hook.

But one species of this genus occurs in Panama, *Coryanthes hunteriana* Schlechter, with flowers of varying color. It grows in tall trees among the hills east of Panama City.

36. STANHOPEA Frost

Stanhopea bucephalus Lindl. is the only species occurring in Panama. In this plant the lip consists of three parts, the unclawed basal part which is an obovate sac, the middle portion consisting of a pair of linear incurved horns, and the terminal part which is a flat, elliptic-ovate or rounded, acute plate. This species grows in Mexico and Panama. In Panama it has been found on McComber Hill, on hills east of Panama City, near San Juan, and on the Juan Grande Range.

37. GONGORA Ruiz & Pav.

Basal horns of the hypochil of the lip ligulate, erect or ascending, apparently weak................................1. **G. quinquenervis** Ruiz & Pav.
Basal horns of the hypochil of the lip short-conic, horizontally spreading, rigid. 2. **G. tricolor** Reichenb. f.

(1.) *Gongora quinquenervis* is a widespread plant occurring throughout Central America and in Venezuela, Surinam, British Guiana, Trinidad, and Peru. In Panama it is found in the foothills east of Panama City, in the hospital grounds at Ancón, and at Matías Hernández. (2.) *G. tricolor*, of formerly uncertain habitat, was recently found by C. W. Powell on foothills east of Panama City and on McComber Hill.

Both species are said to flower more than once a year.

38. BULBOPHYLLUM Thouars

The only Panamanian species, *Bulbophyllum pachyrachis* (A. Rich.) Griseb., is unique among all Panama orchids in having a conspicuously thickened axis of the inflorescence, which is nodding and bears sessile flowers. This plant has creeping rhizomes and 2-leaved pseudobulbs. It is found in the West Indies, and in Guatemala, Costa Rica, and Panama, where it occurs on foothills east of Panama City, near Frijoles, on Barro Colorado Island, at Mamei and Gorgona, on Las Cascadas Plantation near Summit, and along the old Las Cruces Trail between Fort Clayton and Corozal.

39. MAXILLARIA Ruiz & Pav.

Plant caulescent.
  Pseudobulbs 2 or 3-leaved; lip rhombic-lanceolate, without lobes or constrictions............................1. **M. friedrichsthalii** Reichenb. f.
  Pseudobulbs 1-leaved; lip not rhombic, with marked constrictions or lobes.
    Leaf subulate-conduplicate, or rarely lanceolate-elliptic and very fleshy; lip linear-spatulate in outline; column with conspicuous decurved arms at the apex....................................2. **M. macleei** Batem.
    Leaf not subulate-conduplicate, flat and merely coriaceous; lip not spatulate in outline; column without arms.
      Lip conspicuously 3-lobed near the apex, the anterior lobe ovate to semiorbicular; leaves elongate, the mature blades 25 cm. or more long. 3. **M. alba** Lindl.
      Lip lightly constricted above the middle of each side, the anterior portion cuneate-truncate to subquadrate; leaf with mature blades 23 cm. or usually much less in length.
        Pseudobulb strongly ancipitous in the dried specimen, the truncate retuse apex much wider than the leaf petiole; petals ovate to ovate-oblong, a little broader below the middle. 4. **M. diuturna** Ames & Schweinf.

Pseudobulb somewhat compressed but not strongly ancipitous, the narrowed (or rarely rounded) apex little broader than the petiole; petals oblong, usually a little broader above the middle.
5. **M. variabilis** Batem.

Plant cespitose.

Pseudobulbs strongly ancipitous, enveloped on each side by one or more leaf-bearing sheaths; lip lightly 3-lobed with broadly rounded sinuses.

Leaves very fleshy, the one on the pseudobulb 3.4 cm. wide or less; sepals about 5 mm. wide; column distinctly dilated at the apex.
6. **M. crassifolia** Reichenb. f.

Leaves coriaceous, the one on the pseudobulb 5 to 6 cm. wide; sepals 9 to 10 mm. wide; column not dilated above...7. **M. maleolens** Schlechter.

Pseudobulbs more or less compressed, enveloped only by short nonleaf-bearing sheaths or sheath fibers; lip sharply 3-lobed.

Leaf acuminate; flowers red; mid-lobe of lip nearly equal to one-half of the lip, retuse................8. **M. longipetala** Ames & Schweinf.

Leaf obtuse or subacute; flowers not red; mid-lobe of lip equal to about one-third of the lip, acute or obtuse.

Sepals and petals obtuse; lateral sepals oblong, 1.8 cm. long.
9. **M. powellii** Schlechter.

Sepals and petals acute or acutish; lateral sepals lanceolate, narrowed above, 2.8 cm. or more long........10. **M. rousseauae** Schlechter.

(1.) *Maxillaria friedrichsthalii* is a variable plant. It extends from Guatemala to Panama, being recorded from Paja and Bismark. (2.) *M. macleei* ranges from Guatemala through Costa Rica to Panama, occurring at Las Cruces, on Barro Colorado Island, in the San Juan Hills, and on hills east of Panama City. (3.) *M. alba* is recorded from the West Indies, Guatemala, Panama, Guiana, and Brazil, being found on foothills east of Panama City. (4.) *M. diuturna* is found only in Costa Rica and on the Catival-Porto Bello Trail in Panama. (5.) *M. variabilis* (fig. 7) occurs from Mexico through Central America to Panama, being found on hills near Panama City. (6.) *M. crassifolia* extends from the West Indies and Mexico south to Panama, Venezuela, and Brazil, occurring on dead trees in Gatún Lake. (7.) *M. maleolens* is native of Costa Rica, Honduras, and Panama. In Panama it was found on a floating decayed log in Gatún Lake. (8.) *M. longipetiolata* has been found only on a hill east of Corozal. (9.) *M. powellii* occurs in Gatún Lake region, and Schlechter cites it from hills near Panama City. (10.) *M. rousseauae* is found in Costa Rica and Panama, occurring, according to Schlechter, in the region of the Panama Canal and on hills near Panama City.

40. CAMARIDIUM Lindl.

Pseudobulbs 2-leaved; leaves oblong-linear, 1.5 cm. or less wide.
1. **C. ochroleucum** Lindl.

Pseudobulbs 1-leaved; leaves lanceolate-oblong, 3 cm. or more wide.
2. **C. latifolium** Schlechter.

(1.) *Camaridium ochroleucum* is a widespread species ranging from the West Indies and Costa Rica south to Panama, Venezuela, British Guiana, Surinam, and Brazil. It is said by C. W. Powell to be general in the Province of Panama and is cited from the San Juan Hills. (2.) *C. latifolium* is found in hills and valleys east of Panama City and at San Juan and Port Bello.

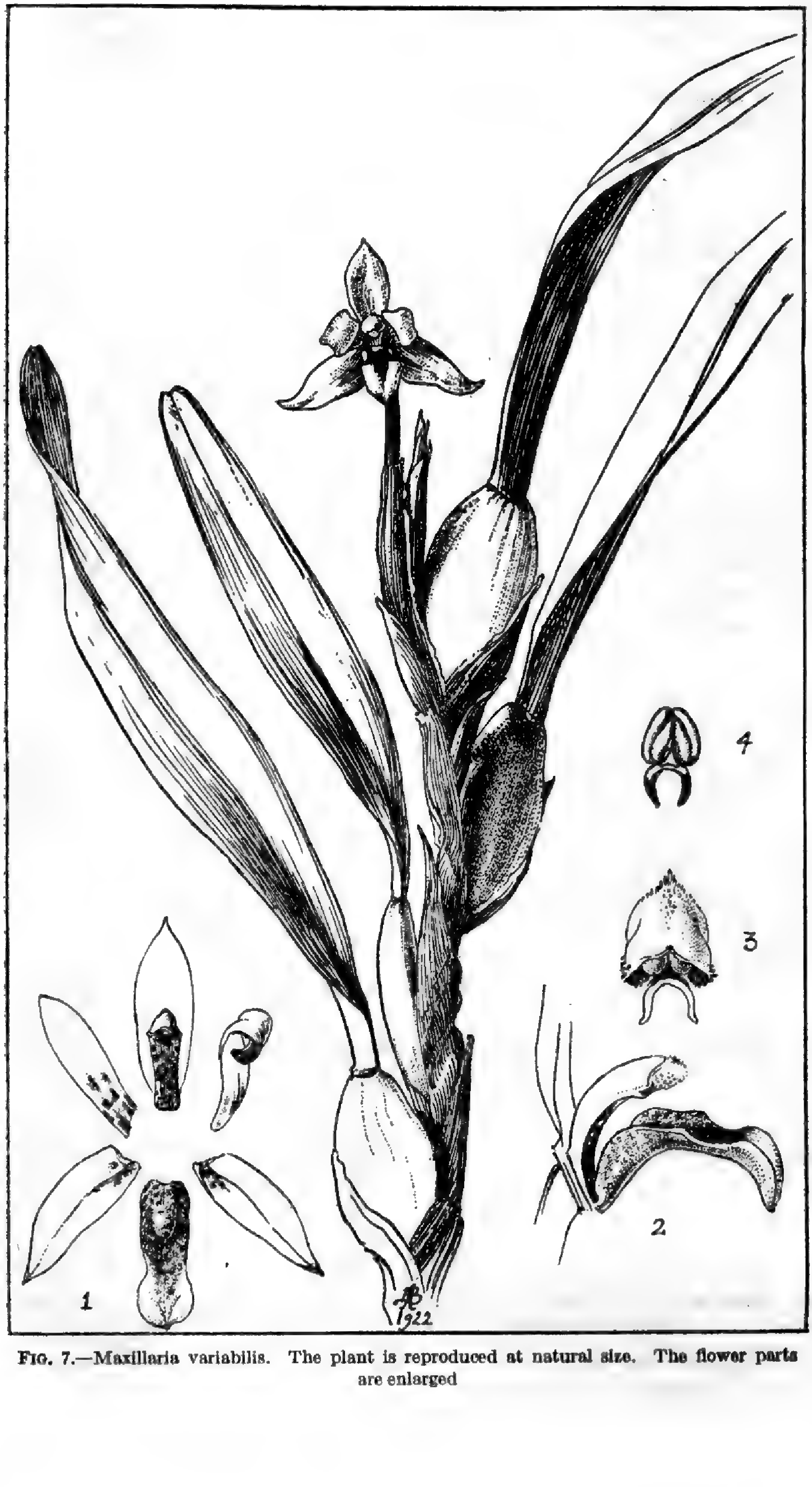

FIG. 7.—Maxillaria variabilis. The plant is reproduced at natural size. The flower parts are enlarged

41. ORNITHIDIUM Salisb.

But one species occurs in the region of the Canal Zone, *Ornithidium anceps* Reichenb. f. This plant has the creeping rhizome closely enveloped by overlapping sheaths, scattering 1-leaved pseudobulbs, lanceolate to strap-shaped leaves, and dense clusters of short-stemmed, very small flowers at the base of the pseudobulbs. Found in Nicaragua and Costa Rica, it is recorded in Panama only from hills north of Frijoles and hills east of Panama City.

42. TRIGONIDIUM Lindl.

Trigonidium egertonianum Batem., known as dragon's-mouth, is a tufted plant with crowded, somewhat flattened-ovoid pseudobulbs which bear 2 elongated strap-shaped leaves and peduncles covered by many tubular sheaths. The dorsal sepal of the large flowers is erect; the lateral sepals are recurved, and the petals and lip very small. This species extends from Mexico throughout Central America. It occurs around Gamboa, Canal Zone, in the Gatún Lake region, and C. W. Powell says that it grows generally in the Province of Panama.

43. MACRADENIA R. Br.

But one species, *Macradenia brassavolae* Reichenb. f., occurs in Panama. This plant has slender, 1 or 2-leaved pseudobulbs, oblong leaves, and many-flowered lateral pendent racemes. The flowers have long acuminate sepals and the mid-lobe of the lip is awl-shaped. It is found in Guatemala, Panama, and Colombia, occurring on the Juan Díaz Range.

44. NOTYLIA Lindl.

Column glabrous.
  Plant small for the genus; leaves 1.1 to 1.4 cm. wide; sepals 3 to 4 mm. long; lip ovate-lanceolate..........................1. **N. pittieri** Schlechter.
  Plant large for the genus; leaves 4 to 5 cm. wide; sepals 8 mm. or more long; lip triangular-trulliform..............2. **N. latilabia** Ames & Schweinf.
Column pubescent or minutely papillose.
  Raceme about 3 cm. in diameter; petals lanceolate, acute; claw of the lip elongate, somewhat shorter than the lamina..3. **N. pentachne** Reichenb. f.
  Raceme hardly 1.5 cm. in diameter; petals lanceolate-linear, acuminate; claw of the lip very short. (This species, which appears to be based on budded material, may prove to be conspecific with the apparently common *N. pentachne* Reichenb. f.)..............4. **N. gracilispica** Schlechter.

(1.) *Notylia pittieri*, a native of Costa Rica, has recently been discovered on Arias Hill near Balboa, Panama. (2.) *N. latilabia* has only one record, the plant collected by C. W. Powell at Frijoles, Canal Zone. (3.) *N. pentachne* is the common *Notylia* of Panama. Confined to Panama, it is recorded from Chagres, Gamboa, Frijoles, Las Cruces, Juan Díaz, and hills east of Panama City. (4.) *N. gracilispica* is reported from hills near Panama City.

45. TRICHOCENTRUM Poepp. & Endl.

But one species of this genus is recorded from Panama. *Trichocentrum panamense* Rolfe is a small plant with minute pseudobulbs bearing a single elliptic-oblong leaf and two or more flowers on a short peduncle, the spur being 4-lobed. Limited to Panama. It was first found on bush-covered hills east of the Panama Canal and was later collected on the upper Chagres River and on the trail from Fort Sherman to the mouth of the Chagres.

46. RODRIGUEZIA Ruiz & Pav.

But one species of this genus occurs in Panama, the widespread *Rodriguezia secunda* Kunth. This is a low but stout plant with compressed 1-leaved pseudobulbs surrounded by 1 or more leaf-bearing sheaths, oblong or strap-shaped leaves, and stout, often one-sided, many-flowered racemes. The pink to rose-purple flowers have a conspicuous saccate base to the connate lateral sepals, and the lip is spurred with a solid horn. The var. *panamensis* Schlechter, said to differ from the species by its smaller flowers and narrower lip, is here included under the species. This plant occurs in the West Indies, Panama, Colombia, Venezuela, Guiana, and Brazil. In Panama it is found on the Catival-Porto Bello Trail, at Paja, and in the Gatún Lake region.

47. IONOPSIS H. B. K.

One species occurs in Panama, *Ionopsis utricularioides* (Swartz) Lindl. This plant has rigid, oblong to narrowly strap-shaped leaves which are sharply pointed; stout, simple or branched racemes which far surpass the leaves; and flowers conspicuous by reason of the large bilobed lip. The var. *parviflora* Schlechter, distinguished by its narrower leaves and much shorter flowers, is here included under the species. From Florida, the West Indies, and Mexico, it extends southward through Central America and northern South America. In Panama it occurs on the hills of San Juan and in foothills near Panama City.

48. TRICHOPILIA Lindl.

Leaves semiterete, linear-ligulate; flowers small, three or more in a loose raceme.
1. **T. hymenantha** Reichenb. f.

Leaves flat, elliptic to oblong; flowers large, one or rarely two.
2. **T. maculata** Reichenb. f.

(1.) *Trichopilia hymenantha* is found on the upper Chagres River and also in the West Indies, Colombia, and Peru. (2.) *T. maculata* is reported from Guatemala and from the following localities in Panama: Orange River Valley, Port Chagres, on mango tree near Balboa, east side of Panama Canal, and generally on mango trees in the vicinity of Panama City.

49. ASPASIA Lindl.

Column straight; flower relatively small, the lateral sepals 1.5 to 2. 2 cm. long.
1. **A. epidendroides** Lindl.

Column lightly curved; flower relatively large, the lateral sepals commonly 2.5 cm. or more long........................2. **A. principissa** Reichenb. f.

(1.) *Aspasia epidendroides*, recorded from Guatemala and occurring nearly throughout Central America, was found at Penonomé in Panama. (2.) *A. principissa* is widely distributed near the Panama Canal. It has been found at San Juan, in the Gatún Lake region north of Frijoles, and on Barro Colorado Island, at Las Cruces, Matachín, Las Cascadas, and Pacora, and in foothills near Panama City, where it is said to be very common. Also a native of Costa Rica.

50. ORNITHOCEPHALUS Hook.

Raceme closely many-flowered; rachis densely lanuginose; lip trifid, the middle lobe linear..1. **O. bicornis** Lindl.

Raceme very loosely few-flowered; rachis subglabrous; lip simply pandurate.
2. **O. powellii** Schlechter.

(1) *Ornithocephalus bicornis* occurs in Costa Rica, and in Panama, where it is found at Las Cruces, at Ana Lago, on Barro Colorado Island, at Arraiján, on the

Panama-Pacora Road near the Tecumen River, and on hills east of Panama City. (2) *O. powellii* is recorded only from Panama. It was found at San Juan and in foothills east of Panama City. Schlechter records it from backwaters of Gatún Lake.

51. BRASSIA R. Br.

The only species occuring in Panama is the widespread *Brassia caudata* (L.) Lindl. It has cylindrical flattened pseudobulbs with overlapping sheaths at the base and 2 or rarely 3 elliptic to oblong leaves at the summit. The flowers, in a loose raceme, have a simple lip which is long-narrowed at the apex and has 2 pairs of calli at the base, the forward pair resembling little teeth. Occurring in Florida, the West Indies, and Mexico, this species extends southward through Central America to Venezuela and Surinam. In Panama it has been found along the Tatare River, at Frijoles, Pedro Miguel, Miraflores, in hospital grounds at Ancón, and in the foothills east of Panama City.

52. ONCIDIUM Swartz

Plant dwarf, 8.5 cm. high or less; leaves equitant.
1. **O. pusillum** (L.) Reichenb. f.
Plant large, over 30 cm. high; leaves not equitant.
  Pseudobulbs wanting or very short and inconspicuous.
    Leaves terete, subulate; lip much surpassing the sepals and petals.
    2. **O. stipitatum** Lindl.
    Leaves flat, oblong to elliptic; lip subequaling the sepals and petals in length.
    3. **O. carthaginense** (Jacq.) Swartz.
  Pseudobulbs large and conspicuous.
    Lip much surpassing the rest of the perianth.
      Pseudobulbs compressed-suborbicular; leaves elliptic to oblong-lanceolate.
      4. **O. ampliatum** Lindl.
      Pseudobulbs narrowly ovate in outline; leaves linear-lorate.
      5. **O. isthmii** Schlechter.
    Lip equaling or shorter than the rest of the perianth.
      Flowers large, 3.5 to 5 cm. wide when spread out, one to three on a branch of the panicle; lip markedly shorter than the lateral sepals.
      6. **O. powellii** Schlechter.
      Flowers small, 2.7 cm. or less wide when spread out; lip about equaling the lateral sepals.
        Floral bracts equaling about one-half the pedicellate ovary; basal half of lip with convex sides............7. **O. panamense** Schlechter.
        Floral bracts equaling one-third the pedicellate ovary or less; basal half of lip with concave sides............8. **O. confusum** Reichenb. f.

The original material of *Oncidium advena* Reichenb. f., found at the now submerged station of Obispo, lacks all vegetative parts and therefore has not been included in this key. Kränzlin, in his monograph (in Engl. Pflanzenreich IV. 50^2: 269. 1922) classes it with *O. baueri* Lindl. and *O. suavis* Lindl.

(1) *Oncidium pusillum* is unique among the Panamanian species in being a dwarf. It is a very widespread species, extending from Mexico through Central America and Colombia to Brazil, Peru, and Bolivia. In Panama it occurs at San Juan, Las Cascadas, and on hills near Panama City. (2.) *O. stipitatum* is said to be one of the commonest orchids of Panama, specimens having been seen from the Tapia River, San Juan, Miraflores, Ceiba Tierra, Las Cruces, Ana Lago, Casa Ladre, Las Cascadas, McComber Hill, and Arraiján. (3.) *O. carthaginense* is a widespread species. It is found in Florida and Jamaica and extends from Mexico southward through Central America and northern South

America. In Panama it was found on the Pacific Coast northwest of Panama City and at Punta Bruja. (4.) *O. ampliatum*, known as the butterfly orchid, extends from Guatemala through Central America and northern South America. In Panama it is said to be very plentiful almost anywhere at sea level, and is recorded from Chagres, Frijoles, Barro Colorado Island, Culebra, Las Cruces, and McComber Hill. (5.) *O. isthmii* is confined to Panama. It was originally found in South Darién and was subsequently collected at San Juan, upper Chagres River. (6.) *O. powellii* is recorded as growing on trees in the backwaters of Gatún Lake and on hills near Frijoles. (7.) *O. panamense* is confined to Panama, where it is found at San Juan and on hills east of Panama City. (8.) *O. confusum* was originally found in Costa Rica. It occurs in Panama at Juan Díaz, Calzada Lago, and in foothills east of Panama City.

53. **LEOCHILUS** Knowles & Westc.

But one species of this genus is found in Panama. *Leochilus scriptus* (Scheidw.) Reichenb. f. is a small epiphyte with ovoid-compressed pseudobulbs which bear at the summit a single narrowly elliptic to oblong leaf. At the base the pseudobulbs are inclosed by one or more pairs of leaf-bearing sheaths. The loose raceme is often branched, the lip is simple and obovate with a bilobed fiddle-shaped callus. The short column has a pair of narrow arms in the middle. This species extends from Guatemala to Panama, where it is recorded from the Juan Díaz Range, Las Cascadas Plantation near Summit, at Arraiján, and on the west side of the Panama Canal. It commonly grows on calabash (*Crescentia*) or cacao trees.

54. **LOCKHARTIA** Hook.

Leaves falcate, lightly decurved and spreading; basal callus of lip simple, ovate-oblong------------------------------------**1. L. pittieri** Schlechter.
Leaves straight and erect or lightly incurved; basal callus of lip bilobed.
  Apex of leaf sharply apiculate; inflorescence a relatively large, divaricate panicle; lip without basal linear lobes--------**2. L. pallida** Reichenb. f.
  Apex of leaf blunt or retuse, not sharply apiculate; inflorescence simple or a small capillary panicle; lip with a pair of basal linear lobes.
    3. L. micrantha Reichenb. f.

(1.) *Lockhartia pittieri* is confined to Panama. It was localized at Bohío (now submerged, but the plant cultivated at Culebra by Mrs. Rousseau), and was subsequently found on wooded hills near Frijoles, Fort Sherman, and mouth of Chagres River Trail, and on the Catival-Porto Bello Trail. (2.) *L. pallida* is native in Panama, Colombia, and Venezuela. In Panama it is recorded from Chagres, Pedro Miguel, Chiva-Chiva, forests of Juan Díaz near Panama City, and on foothills east of Panama City. (3.) *L. micrantha*, of Costa Rica and Panama, has been collected at Pedro Miguel, Río Pedro Miguel near East Paraíso, Miraflores, Las Cruces, Ojo del Agua, and in hills east of Panama City.

55. **CHONDRORRHYNCHA** Lindl.

The single Panamanian species, *Chondrorrhyncha lipscombiae* Rolfe, has a large transverse many-toothed callus at the base of the lip. The flowers are white with purple lines on the lip. It is found in the Gatún Lake region and at Summit.

56. **DICHAEA** Lindl.

Plant small; leaves 1 to 4 cm. long, in alternating zones of longer and shorter blades, glaucous; lateral sepals falcate-lanceolate--**1. D. panamensis** Lindl.
Plant large for the genus; leaves 5 to 8.5 cm. long, gradually shortened above; lateral sepals ovate-oblong-------------------**2. D. powellii** Schlechter.

(1) *Dichaea panamensis* is found in Costa Rica and Panama, where it is recorded from the Río Tapia, Chiva-Chiva, Miraflores, Pedro Miguel, Paja, Chorrera, hills between Río Grande and Pedro Vidal on road to Arraiján, in hills east of Panama City, and above Penonomé. (2) *D. powellii* is reported only from hills near Bohío, Canal Zone.

57. CAMPYLOCENTRUM Benth.

Leaves commonly 5 to 7 cm. long; sepals and petals ligulate, acute or acuminate; basal lobes of lip semiovate and distinct__**1. C. micranthum** (Lindl.) Rolfe.

Leaves 8 to 9 cm. long; sepals and petals oblong-spatulate; basal lobes of lip minute, apex dentiform______________________**2. C. panamense** Ames.

(1) *Campylocentrum micranthum* is a widespread, variable, and common species, extending from the West Indies and Guatemala southward through Central America to Panama, Venezuela, Guiana, and eastern Brazil. In Panama it is recorded from San Juan, Gamboa, Las Cascadas Plantation, and hills near Panama City. (2) *C. panamense* is known from a single collection, in 1860, on trees at Gatún, Panama.

LIST OF IMPORTANT SYNONYMS OF SPECIES INCLUDED IN THIS ENUMERATION

Aspasia rousseauae Schlechter is *Aspasia principissa* Reichenb. f.

Bletia alata Hitchc. is *Limodorum tuberosum* L.

Bletia purpurea DC. is *Limodorum tuberosum* L.

Bletia verecunda R. Br. is *Limodorum tuberosum* L.

Brassavola venosa Lindl. is *Brassavola nodosa* (L.) Lindl.

Brassia longissima Schlechter, Repert. Sp. Nov. Fedde. Beih. 17: 80. 1922. Not *B. longissima* Schlechter, Orchideen 496. 1914 is *Brassia caudata* (L.) Lindl.

Brassia longissima var. *minor* Schlechter is *Brassia caudata* (L.) Lindl.

Bulbophyllum wagneri Schlechter is *Bulbophyllum pachyrachis* (A. Rich.) Griseb.

Camaridium affine Schlechter is *Camaridium ochroleucum* Lindl.

Campylocentrum peniculus Schlechter is *Campylocentrum micranthum* (Lindl.) Rolfe.

Catasetum warscewiczii Schlechter, not Lindl. & Paxt., is *Catasetum scurra* Reichenb. f.

Coryanthes powellii Schlechter is *Coryanthes hunterianum* Schlechter.

Cypripedium chica Kränzl. is *Selenipedium chica* Reichenb. f.

Dichaeopsis panamensis Schlechter is *Dichaea panamensis* Lindl.

Dimerandra isthmii Schlechter is *Epidendrum stenopetalum* Hook.

Dimerandra stenopetala Schlechter is *Epidendrum stenopetalum* Hook.

Encyclia atropurpurea Schlechter is *Epidendrum atropurpureum* Willd.

Epidendrum benignum Ames is *Epidendrum subpatens* Schlechter.

Epidendrum brevicaule Schlechter is *Epidendrum schlechterianum* Ames.

Epidendrum chlorocorymbos Schlechter is *Epidendrum difforme* Jacq.

Epidendrum colonense Ames is *Epidendrum sculptum* Reichenb. f.

Epidendrum cycnostalix Reichenb. f. is *Epidendrum stamfordianum* Batem.

Epidendrum equitans Lindl. is *Epidendrum equitantifolium* Ames.

Epidendrum hoffmannii Schlechter is *Epidendrum ionophlebium* Reichenb. f.

Epidendrum isthmii Schlechter is *Epidendrum floribundum* H. B. K.

Epidendrum leucocardium Schlechter is *Epidendrum eburneum* Reichenb. f.

Epidendrum lorifolium Schlechter is *Epidendrum imatophyllum* Lindl.

Epidendrum pachycarpum Schlechter is *Epidendrum ionophlebium* Reichenb. f.

Epidendrum piliferum Reichenb. f. is *Epidendrum floribundum* H. B. K.

Epidendrum porphyrophyllum Schlechter is *Epidendrum porpax* Reichenb. f.

Epidendrum verecundum Schlechter is *Epidendrum strobiliferum* Reichenb. f.

Epithecia panamensis Schlechter is *Dichaea panamensis* Lindl.

Eulophia longifolia Schlechter is *Eulophia alta* (L.) Fawc. & Rendle.

Gongora aromatica Schlechter, not Reichenb. f., is *Gongora tricolor* Reichenb. f.

Gongora powellii Schlechter is *Gongora quinquenervis* Ruiz & Pav.

Gongora tricolor Schlechter, not Reichenb. f., is *Gongora quinquenervis* Ruiz & Pav.

Habenaria patentiloba Ames is *Habenaria avicula* Schlechter.

Habenaria warscewiczii Schlechter is *Habenaria petalodes* Lindl. var. *micrantha* Reichenb. f.

Leochilus major Schlechter is *Leochilus scriptus* (Scheidw.) Reichenb. f.

Leochilus powellii Schlechter is *Leochilus scriptus* (Scheidw.) Reichenb. f.

Leucohyle subulata Schlechter is *Trichopilia hymenantha* Reichenb. f.

Leucohyle warscewiczii Klotzsch is *Trichopilia hymenantha* Reichenb. f.

Lockhartia variabilis Ames & Schweinf. is *Lockhartia pittieri* Schlechter.

Masdevallia panamensis Ames is *Masdevallia livingstoneana* Roezl & Reichenb. f.

Maxillaria gatunensis Schlechter is *Maxillaria crassifolia* (Lindl.) Reichenb. f.

Maxillaria panamensis Schlechter is *Maxillaria variabilis* Batem.

Maxillaria pubilabia Schlechter is *Maxillaria rousseauae* Schlechter.

Maxillaria stachyobiorum Reichenb. f. is *Xylobium stachyobiorum* (Reichenb. f.) Hemsl.

Maxillaria stenostele Schlechter is *Maxillaria macleei* Batem.

Mormodes hookeri Schlechter, not Lem., is *Mormodes igneum* Lindl. & Paxt.

Nidema boothii (Lindl.) Schlechter var. *triandrum* Schlechter is *Epidendrum ottonis* Reichenb. f.

Oncidium oerstedii Reichenb. f. var. *crispiflorum* Schlechter is *Oncidium carthaginense* (Jacq.) Swartz.

Oncidium viridifolium H. B. K. is *Oncidium pusillum* (L.) Reichenb. f.

Ornithocephalus diceras Schlechter is *Ornithocephalus bicornis* Lindl.

Ornithocephalus lanuginosus Ames is *Ornithocephalus bicornis* Lindl.

Pleurothallis choconiana S. Wats. is *Pleurothallis marginata* Lindl.

Pleurothallis panamensis Schlechter is *Pleurothallis marginata* Lindl.

Pleurothallis pergracilis Rolfe is *Pleurothallis marginata* Lindl.

Pleurothallis pyrsodes Schlechter, not Reichenb. f., is *Pleurothallis barbosselloides* Schlechter.

Pogonia rosea Hemsl. is *Cleistes rosea* Lindl.

Polystachya panamensis Schlechter is *Polystachya minor* Fawc. & Rendle.

Ponera amethystina Reichenb. f. is *Scaphyglottis amethystina* (Reichenb. f.) Schlechter.

Ponera behrii Reichenb. f. is *Scaphyglottis behrii* (Reichenb. f.) Benth. & Hook. f.

Ponthieva glandulosa R. Br. is *Ponthieva racemosa* (Walt.) Mohr.

Sarcoglottis hunteriana Schlechter is *Sarcoglottis picta* (Anders.) Klotzsch.

Sarcoglottis powellii Schlechter is *Sarcoglottis picta* (Anders.) Klotzsch.

Scaphosepalum panamense Schlechter is *Masdevallia livingstoneana* Roezl & Reichenb. f.

Scaphyglottis behrii Schlechter, not (Reichenb. f.) Benth. & Hook. f. ex Hemsl., is *Scaphyglottis laevilabia* Ames.

Scaphyglottis brachiata Schlechter is *Scaphyglottis amethystina* (Reichenb. f.) Schlechter.

Scaphyglottis powellii Schlechter is *Scaphyglottis mesocopis* (Endr. & Reichenb. f.) Benth. & Hook. f. ex Hemsl.

Sobralia epiphytica Schlechter is *Sobralia suaveolens* Reichenb. f.

Sobralia rolfeana Schlechter is *Sobralia macrophylla* Reichenb. f.

Spiranthes acaulis Cogn. is *Sarcoglottis picta* (Anders.) Klotzsch.

Spiranthes epiphytica Schlechter is *Spiranthes prasophyllum* Reichenb. f.

Stelis collina Schlechter is *Stelis williamsii* Ames.

Stelis flexuosa Kranzl., not Lindl., is *Stelis crescentiicola* Schlechter.

Stelis isthmi Schlechter is *Stelis crescentiicola* Schlechter.

Stelis panamensis Schlechter is *Stelis gracilis* Ames.

Stelis praemorsa Schlechter is *Stelis crescentiicola* Schlechter.

Trichopilia powellii Schlechter is *Trichopilia maculata* Reichenb. f.

Trigonidium seemannii Schlechter, not Reichenb. f., is *Trigonidium egertonianum* Batem. ex Lindl.

Vanilla planifolia Andr. is *Vanilla fragrans* (Salisb.) Ames

The following additional species, not included in the present list, are recorded from the Isthmus of Panama (without locality) by Reichenbach fil. in Seemann, Bot. Voy. Herald, 214–15, 1854.

1. *Stenorrhynchus speciosus* L. Rich. Panama.
2. *Sobralia fenzliana* Reichenb. f. Panama, on trees.
3. *Oncidium altissimum* Smith. On trees, all over the country.
4. *Trigonidium seemannii* Reichenb. f. Panama.
5. *Epidendrum radicans* Pav. Panama.
6. *Bletia florida* R. Br. In savannas, Veraguas.
7. *Hexadesmia micrantha* Lindl. Panama.
8. *Pleurothallis perpusilla* Reichenb. f. Near Panama, on trees.
9. *Selenipedium hartwegii* Reichenb. f. Darién, on the seacoast.

The species mentioned above have not been cited in this enumeration because of lack of definite locality and because of their absence from all recent collections.

1. *Stenorrhynchus speciosus* L. Rich. is frequent in Costa Rica.
2. *Sobralia fenzliana* Reichenb. f. is recorded fron Chiriquí, outside the range of this list.
3. *Oncidium altissimum* (Jacq.) Swartz, not Smith, is recorded in Kränzlin's Monograph of Oncidium from no nearer station than Guatemala.
4. *Trigonidium seemannii* Reichenb. f. appears to be a somewhat doubtful species, as all recent plants of the genus are referable to *T. egertonianum* Batem. ex Lindl.
5. *Epidendrum radicans* Pavón ex Lindl. has been found in Chiriquí and is common in Costa Rica.
6. *Bletia florida* R. Br. occurs outside the range of this flora.
7. *Hexadesmia micrantha* Lindl. is common in Costa Rica.
9. *Selenipedium hartwegii* Reichenb. f. was later found by Reichenbach fil. to be *Cypripedium hincksianum* (*Phragmopedilum longifolium*). Cf. Gard. Chron. 1: 202. 1878. Darién is beyond the range of this list.

29. CASUARINACEAE. Beefwood Family

1. CASUARINA L. BEEFWOOD

Casuarina equisetifolia L., native of tropical Asia and Africa, is planted occasionally about Panama City. It is a tree somewhat like a pine in general appearance, with spreading whorled branches, and very slender, grayish branchlets bearing whorls of scales, the branchlets closely suggestive of the stems of horsetail (*Equisetum*). The fruit, resembling a small cone, is 1 to 2 cm. in diameter. It is a common ornamental tree in Central America, known in Yucatán and Cuba as "pino" or "ciprés"; in Cuba and Salvador as "pino de Australia"; and in Nicaragua as "sauce." The English name of this species is horsetail-tree.

30. PIPERACEAE. Pepper Family

(Contributed by Dr. William Trelease)[14]

Stigmas 2 to 5 (usually 3 or 4); large plants, usually woody, the leaves not fleshy; plants (in our species) terrestrial.
  Spikes several on a common peduncle; plants suffrutescent. **1. POTHOMORPHE.**
  Spikes opposite the leaves, solitary; plants woody ---------- **2. PIPER.**
Stigma 1; small herbs, the leaves usually thick and fleshy; plants nearly all epiphytic ---------- **3. PEPEROMIA.**

The plants of this family, one of the largest and most characteristic groups of tropical American plants, are easily recognized by their dense, terete, slender, usually elongate flower spikes, which resemble catkins. The leaves are mostly alternate and always entire.

The Panama Piperaceae have been monographed recently by Trelease.[15]

1. POTHOMORPHE Miquel

Two species of the genus are common plants in Central America, but the two seldom or never grow together, and only one, *P. peltata* (L.) Miquel (*Piper peltatum* L.), is known from the zone. The other species (*P. umbellata* (L.) Miquel) has been collected in Chiriquí.

P. peltata is a coarse, herbaceous or suffrutescent plant, usually about a meter high, with very large, rounded-cordate, peltate leaves, and clusters of long whitish spikes. It is common here in forests and is known as "Santa María." It is stated by the country people of Central America generally that if the leaves are rubbed upon the body one will not be attacked by garrapatas or ticks. Since the plant rarely grows in places infested by these pests its utility would seem to be not very great, and the writer has never tested its efficacy.

2. PIPER L.

Leaves palmately nerved.
  Petioles very short, not winged ---------- **1. P. smilacifolium** H. B. K.
  Petioles elongate, winged ---------- **2. P. san-joseanum** C. DC.
Leaves pinnately (or multiple) nerved.
  Midrid subequally branched throughout.
    Leaf base appreciably acute.
      Leaves pubescent on both surfaces ---------- **3. P. gatunense** Trel.
      Leaves glabrous on the upper surface.
        Leaves pubescent beneath, at least on the nerves. **4. P. polyneurum** C. DC.
        Leaves glabrous beneath.
          Leaves drying green.
            Berries depressed-globose ---------- **5. P. acutissimum** Trel.
            Berries ellipsoid ---------- **6. P. laxispicum** Trel.
          Leaves bronzing beneath in drying ---------- **7. P. cordulatum** C. DC.
    Leaf base appreciably obtuse or cordulate, at least on one side.
      Leaves pubescent on both sides ---------- **3. P. gatunense** Trel.
      Leaves glabrous, at least on the upper surface.
        Leaves large, granular ---------- **4. P. polyneurum** C. DC.

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[14] The determinations and keys have been supplied by Doctor Trelease. The notes are by the author of the Flora.—P. C. S.

[15] Contr. U. S. Nat. Herb. **26**: 15–50. 1927.

Leaves scarcely 6 by 15 cm.
Leaf base nearly equilateral------------7. **P. cordulatum** C. DC.
Leaf base distinctly inequilateral.
Leaves acuminate-----------------8. **P. subnudispicum** Trel.
Leaves rather blunt-----------------9. **P. tuberculatum** Jacq.
Midrib without strong ascending branches upward.
Leaf base appreciably acute.
Leaves puberulent or pubescent beneath, at least on the nerves.
Leaves glossy, equilateral at base------------10. **P. tapianum** Trel.
Leaves dull, oblique at base-------------11. **P. lucigaudens** C. DC.
Leaves glabrous beneath.
Leaves scarcely 5 by 14 cm---------------12. **P. subtrinerve** Trel.
Leaves much larger------------------------13. **P. tecumense** Trel.
Leaf base appreciably obtuse, at least on one side.
A. Leaves glabrous on the upper surface between the nerves.
Leaves glabrous beneath--------------14. **P. pseudo-variabile** Trel.
Leaves puberulent or pubescent beneath, at least on the nerves.
Nerves puberulent beneath--------15. **P. paulownifolium** C. DC.
Nerves, at least, pubescent beneath.
Leaves inequilaterally cordate-auricled at base.
Petiole fleshy-warty--------16. **P. imperiale** (Miquel) C. DC.
Petiole not warty.
Leaves subacute----------------17. **P. auritum** H. B. K.
Leaves long-acuminate-----18. **P. peracuminatum** C. DC.
Leaves mostly cordulate at base.
Petioles glabrous--------------------13. **P. tecumense** Trel.
Petioles hairy.
Twigs villous------------------35. **P. culebranum** C. DC.
Twigs not villous.
Twigs transiently appressed-hairy--19. **P. diazanum** Trel.
Twigs crisp-hairy, hirsute, or velvety-pubescent.
Twigs sparsely subvelvety-pubescent. Leaves oblanceolate------------------20. **P. subdilatatum** Trel.
Twigs crisp-hairy or hirsute.
Twigs glabrescent, green--21. **P. taboganum** C. DC.
Twigs with persistent pubescence.
Leaves cordulate at base, rather glossy.
Leaves glabrescent beneath between the nerves.
22. **P. gonocarpum** Trel.
Leaves loosely hairy beneath.
23. **P. pubistipulum** C. DC.
Leaves not cordulate, dull.
24. **P. panamense** C. DC.
AA. Leaves rough or pubescent on both surfaces.
Leaves about half as broad as long or broader.
Leaves scabrous.
Twigs villous--------------------25. **P. villiramulum** C. DC.
Twigs hirsute or crisp-pubescent.
Twigs hirsute------------------26. **P. non-retrorsum** Trel.
Twigs crisp-pubescent--------27. **P. pseudo-cativalense** Trel.
Leaves scarcely scabrous.
Leaves large, about 10 by 20 cm-----------28. **P. stevensi** Trel.
Leaves much smaller------------------29. **P. cativalense** Trel.

Leaves less than half as broad as long.
  Leaves scabrous on the upper surface.
    Spikes curved or hooked..............30. **P. elongatum** Vahl.
    Spikes nearly or quite straight.
      Twigs villous.
        Leaves obliquely ovate-elliptic..25. **P. villiramulum** C. DC.
        Leaves subequilateral, elliptic-oblong.
          31. **P. viridicaule** Trel.
      Twigs crisp-pubescent or appressed-pubescent.
        Leaves rough, oblong..............32. **P. breve** C. DC.
        Leaves smoother.
          Leaves broadly lance-elliptic...33. **P. chagresianum** Trel.
          Leaves broadly oblanceolate...20. **P. subdilatatum** Trel.
  Leaves scarcely scabrous.
    Twigs at first appressed-canescent..........32. **P. breve** C. DC.
    Twigs subvillous, not canescent.
      34. **P. pseudo-garagaranum** Trel.

The genus *Piper* forms one of the largest groups of Central American plants, and it is well represented in the Canal Zone. From the Republic of Panama over 90 species are known. A few of the Central American species are widely distributed. Most of them seem to be very local in their ranges, but many of the Canal Zone species occur on both the Atlantic and Pacific slopes. Although several hundred specimens have been collected within our area, many of the species still are known from only one or two specimens. Several described species whose localities within Panama are not known definitely may have been collected about the zone, but they are not listed here. It is probable that further exploration will reveal the presence in this region of a good many additional species.

In Panama the Pipers are known by the names "gusanillo," "hinojo," and "cordoncillo," and among the West Indians as "cowfoot." The name "cordoncillo" is the one most commonly employed elsewhere in Central America.

The plants, usually shrubs 1 to 3 meters high, form an important part of the undergrowth in the more humid forests, and some grow abundantly in dry thickets or on cut-over land. They are of no economic importance.

P. smilacifolium is one of the most abundant shrubs of the Atlantic slope. It is larger than most Pipers, sometimes becoming a tree as much as 6 meters high. Other species common here are *P. san-joseanum*, *P. paulownifolium*, *P. imperiale*, *P. villiramulum*, and *P. breve*. *P. auritum*, abundant in open places on the Atlantic slope, is one of the species most easily recognized, distinguished by its very large, pubescent leaves with a deep basal sinus. This plant when crushed exhales a strong, characteristic, and agreeable odor, somewhat like that of sarsaparilla.

3. PEPEROMIA Ruiz & Pav.

Leaves opposite or whorled, small.
  Leaves opposite, rounded......................1. **P. cyclophylla** Miquel.
  Leaves whorled, round-obovate....................2. **P. viridispica** Trel.
Leaves alternate.
  Leaves subpeltate, subcordate.
    Stem stout; spikes large......................3. **P. cordulata** C. DC.
    Stem slender; spikes small..................4. **P. cordulatiformis** Trel.
  Leaves not peltate.
    Spikes panicled............................5. **P. mameiana** C. DC.

Spikes not panicled.
Leaves palmately nerved.
Leaf base appreciably acute.
Leaves evidently silky-pubescent-------**6. P. obscurifolia** C. DC.
Leaves at most subpuberulent------------**7. P. conjungens** Trel.
Leaf base appreciably obtuse or cordate.
Leaves evidently pubescent.
Leaves round-subobovate-------**8. P. rotundifolia** (L.) H. B. K.
Leaves round-subcordate-----------**9. P. scandens** Ruiz & Pav.
Leaves at most ciliolate or obscurely puberulent.
Plants creeping; leaves obovate------**10. P. panamensis** C. DC.
Plants erect; leaves round-ovate.
Stem short and stout; plants epiphytic-------**11. P. killipi** Trel.
Stem elongate; plants terrestrial-**12. P. pellucida** (L.) H. B. K.
Leaves pinnately nerved.
Leaf base appreciably obtuse or cordate.
Plants densely velvety-pubescent.
Leaves 5 cm. long, obscurely granular-------**13. P. stevensi** Trel.
Leaves 8 to 13 cm. long, very granular--**14. P. ciliobractea** C. DC.
Plants more or less transiently pubescent.
Leaves drying thick; peduncle long------**15. P. piperorum** Trel.
Leaves drying thin.
Peduncle elongate---------------**16. P. caudulilimba** C. DC.
Peduncle very short---------------**17. P. gatunensis** C. DC.
Leaf base acute or cuneate.
Leaves 6 to 12 cm. long--------**18. P. dodecatheontophylla** Trel.
Leaves 12 to 20 cm. long--------------------**19. P. flavispica** Trel.

The species of *Peperomia* are small herbs, usually but not always with very thick and succulent leaves. All our species except *P. pellucida* are epiphytic. Since in the lowlands they grow chiefly on tall trees, it is difficult to collect them, and they are poorly represented in herbaria. The genus is represented in Panama by 44 known species, and there are many others elsewhere in Central America. The plants are scarcely of economic importance, although on Taboga Island I was informed that the leaves of *P. viridispica* var. *perejil* Trel. were eaten as a salad, the plant being called "perejil." On Taboga *P. pellucida* is given the name of "hierba de sapo." *P. rotundifolia* is sometimes called "poleo."

31. LACISTEMACEAE. Lacistema Family

1. LACISTEMA Swartz

Flowers sessile within the bracts; leaves glabrous.
1. L. aggregatum (Berg) Rusby.
Flowers pediceled; leaves barbate beneath along the nerves.
2. L. pedicellatum Standl.

The plants are shrubs or small trees with short-petioled, oblong or obovate-oblong, cuspidate-acuminate, entire or obscurely toothed leaves 8 to 15 cm. long. The small inconspicuous flowers are perfect and borne in small, clustered or solitary, bracted, axillary spikes. The small 3-valved capsule is red and somewhat fleshy at maturity, containing one to three seeds.

L. aggregatum, widely distributed in tropical America, is occasional here in woods. *L. pedicellatum* is an endemic tree of the Atlantic slope.

32. SALICACEAE. Willow Family

1. SALIX L. WILLOW

Salix chilensis Mol. (of which *S. humboldtiana* is a synonym) is planted in Ancón, but is not native. It is the common willow of Central America and the only one native in the region, except for two species in Guatemala. It is a tree with linear-lanceolate leaves. The Spanish name is "sauce."

33. ULMACEAE. Elm Family

The typical genus (*Ulmus*) of the family consists of the elms, none of which occur in Central America. In the mountains of Chiriquí, however, there is a large tree, known locally as "ceniza" or "cenizo," *Chaetoptelea mexicana* Liebm., which has been referred by some authors to the genus *Ulmus*.

Shrub or tree, 1 to 15 meters high, unarmed; leaves mostly oblong-lanceolate, usually long-acuminate, finely serrate; fruit a red drupe 2 mm. long. **1. TREMA.**

Shrub or tree, 3 to 12 meters high, armed with stout recurved spines; leaves ovate or oval, 3-nerved, rounded or short-acuminate at apex, serrate; fruit a yellow drupe 8 to 12 mm. long........................**2. CELTIS.**

1. TREMA Lour.

A single species, *T. micrantha* (L.) Blume, occurs in Central America, and is common in the Canal Zone. The usual vernacular name in Central America is "capulín." In Porto Rico it is known as "guacimilla," doubtless because of the resemblance of the leaves to those of *Guazuma ulmifolia*.

2. CELTIS L.

To this genus belong the hackberries or sugarberries of the United States. The only Central American species, *C. iguanaea* (Jacq.) Sarg., seems to be rather rare about the zone. In general appearance it is very unlike the common United States species. In some parts of Central America it is known as "cagalera."

34. MORACEAE. Mulberry Family

Plants herbaceous, acaulescent. Leaves long-petiolate, deeply lobed; flowers borne on a long-stalked green quadrangular receptacle....**1. DORSTENIA.**

Plants trees or shrubs.
  Leaves deeply lobed.
    Leaves pinnately lobed. Fruit very large, rough......**2. ARTOCARPUS.**
    Leaves palmately lobed.
      Flowers in dense clustered spikes; leaves peltate......**3. CECROPIA.**
      Flowers in loose cymes; leaves not peltate............**4. POUROUMA.**
  Leaves entire or toothed (those of young shoots sometimes lobed in *Morus* and *Chlorophora*).
    Flowers borne upon the inner surface of a globose or oblong, hollow receptacle, this with a small opening at apex. Trees with entire leaves. **5. FICUS.**
    Flowers variously arranged but never on the inside of a receptacle.
      Flowers of one or both sexes in ament-like spikes or racemes.
        Trees usually armed with spines; pistillate flowers in globose heads. Leaves mostly ovate, entire or serrate, often lobed on young branches.............................**6. CHLOROPHORA.**

Trees unarmed; pistillate flowers in spikes or racemes.
  Stamens not inflexed in bud. Leaves entire or nearly so, oblong or obovate-oblong, caudate-acuminate; flowers spikes lax and interrupted..7. **SOROCEA.**
  Stamens inflexed in bud.
    Pistillate perianth tubular, inclosing the fruit; seeds large. Leaves oblong to obovate, usually entire..............8. **TROPHIS.**
    Pistillate perianth of distinct segments, not inclosing the fruit; seeds minute. Leaves ovate or rounded-ovate, serrate. 9. **MORUS.**
Flowers not in spikes or racemes, arranged in heads or upon flattened receptacles, or sometimes solitary.
  Plants with stout prickles on stipules and branchlets. Leaves oblong to rounded-ovate, rounded and apiculate at apex; pistillate receptacles 3 to 7-flowered....................10. **INOPHLOEUM.**
  Plants unarmed.
    Ovules erect; staminate peduncles bearing several heads. Leaves entire, broad, long-petiolate...............11. **COUSSAPOA.**
    Ovules pendulous; staminate peduncles bearing a single head or receptacle.
      Pistillate receptacles 1-flowered.
        Staminate perianth none; stamens irregularly scattered over the surface of the receptacle; leaves glabrous, oblong, entire. 12. **PSEUDOLMEDIA.**
        Staminate perianth present; stamens 4; leaves scaberulous, oblong or oblanceolate, serrate above......13. **OLMEDIA.**
      Pistillate receptacles several or many-flowered.
        Staminate flowers without a perianth, the stamens irregularly scattered over the surface of the receptacle.14. **CASTILLA.**
        Staminate flowers with a perianth; stamens 4.
          Style thick, short, short-lobate; leaves hairy beneath. 15. **PEREBEA.**
          Style slender, elongate, with 2 long slender stigmas; leaves glabrous......................16. **HELICOSTYLIS.**

The Panama representatives of the mulberry family are so diverse in character that it is impossible to mention any group of characters by which they may be easily recognized and associated. Most of them are trees with alternate leaves, stipules, and milky sap. The flowers are small and green, often arranged in heads or catkinlike spikes or racemes.

Besides the genera listed here, species of *Piratinera* and *Brosimum* occur elsewhere in Panama. *Brosimum utile* (H. B. K.) Pittier is the interesting cowtree or "palo de leche," which is found along the San Blas coast.[16]

1. DORSTENIA L.

Dorstenia contrajerva L., common in moist forests and thickets, is an inconspicuous acaulescent perennial herb with long-petiolate, deeply lobed leaves. The large green quadrangular receptacles are borne on long erect peduncles. This species is common in most of Central America, and is known universally as "contrahierba." Various medicinal properties are ascribed to it. In Salvador the thick rootstocks are used to flavor cigarettes.

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[16] See Contr. U. S. Nat. Herb. **20**: 120. 1918.

2. ARTOCARPUS Forst. BREADFRUIT

The breadfruit, *A. communis* Forst., native of the East Indies and the Pacific islands, is known by the Spanish names "árbol de pan" and "fruta de pan." It is planted here and there about the zone, and the fruit is sometimes offered in the Panama market. Breadfruit is a vegetable which finds special favor among the West Indian negroes, and is planted everywhere in the parts of Central America inhabited by them. The tree makes a handsome shade tree. At Frijoles there is cultivated a form of the tree with exceptionally large, edible seeds, known as breadnuts.

The jackfruit, *A. integrifolia* L. f., is planted occasionally. Its fruit is similar to that of the breadfruit, but the leaves are obovate or oblong and mostly entire. The fruit is edible when cooked, but is inferior in quality to breadfruit.

3. CECROPIA L. GUARUMO

Pistillate spikes slender, 20 to 40 cm. long..............1. **C. mexicana** Hemsl.
Pistillate spikes thick, usually less than 8 cm. long.
  Staminate spikes 8 to 12 cm. long..................2. **C. longipes** Pittier.
  Staminate spikes 4.5 cm. long or shorter..........3. **C. arachnoidea** Pittier.

The name trumpet-tree is sometimes applied to the species of *Cecropia*. The vernacular name throughout Central America is "guarumo," and the West Indians in the zone employ the name "trompy."

The Cecropias are usually medium-sized trees but often only shrubs, with few branches, the trunks smooth and whitish or pale green. The large leaves are long-petioled, peltate, deeply palmate-lobed, and usually covered beneath with a white felt. The flowers are arranged in thick pale aments, clustered at the end of a stout peduncle, the pistillate and staminate upon separate trees. Before flowering the head of spikes is covered by a white involucre.

Cecropia trees are abundant in the zone, as everywhere in Central America at low altitudes, especially on cut-over land. There is probably no other single plant that has so large a part in giving to Central American vegetation its characteristic appearance, as distinguished from that of temperate regions.

The trunks of the trees are hollow and invariably inhabited by small ants which bite severely when disturbed. The stems are said to have been used by the aborigines for making trumpets, and the larger trunks are sometimes split to be used for water troughs. The tough fiber of the bark has been employed by the Central American Indians for cordage, mats, and a kind of coarse cloth. The sap is said to yield small amounts of rubber.

Cecropia mexicana (pl. 23) is one of the most abundant of the local species. Other species than those listed occur in Panama remote from the zone.

4. POUROUMA Aubl.

The only Central American species, *P. aspera* Trécul, occurs in the forests. It is a large or medium-sized tree, with leaves resembling those of the Cecropias, but not peltate. The name "mangabé" is applied to it locally, while in Costa Rica it is known as "guarumo." The hollow petioles are used by boys to make popguns.

5. FICUS L. FIG

Receptacles borne in panicles upon the trunk..............1. **F. conora** King.
Receptacles solitary or in pairs in the axils of the leaves.
  Receptacles solitary in the leaf axils; leaves often scabrous. Involucre at
    base of receptacle 3-lobed.

Leaves hirtellous or short-pilose beneath, oval-oblong to obovate-oval, rounded or very obtuse at apex, the lateral nerves slender; receptacles pilose or hirtellous, 1.5 to 2.5 cm. in diameter.
2. F. glaucescens (Liebm.) Miquel.

Leaves glabrous or merely scabrous beneath; receptacles glabrous or nearly so, somestimes scabrous.

Lateral nerves of the leaves very coarse and stout, 1.5 to 4.5 cm. apart. Leaves oval or obovate-oval, 12 to 25 cm. long, rounded or very obtuse, at apex, very thick; receptacles 2 to 2.5 cm. in diameter.
3. F. tonduzii Standl.

Lateral nerves slender, usually not over 1 cm. apart.

Leaves gradually acute or acuminate at apex, elliptic-oval to oblong, 12 to 30 cm. long. Receptacles 1.5 to 4 cm. in diameter or even larger-------------------------------**4. F. glabrata** H. B. K.

Leaves rounded or very obtuse at apex or abruptly apiculate, oblong to oval. Receptacles 1.5 to 3 cm. in diameter.

Stipules 1 to 1.5 cm. long; leaves scabrous, usually apiculate, the lateral nerves 7 to 12 pairs---------------**5. F. radula** Willd.

Stipules 4 to 6 cm. long; leaves glabrous, very obtuse, not apiculate, the lateral nerves 14 to 22 pairs------**6. F. crassiuscula** Warb.

Receptacles in pairs in the leaf axils; leaves glabrous or pubescent but never scabrous. Involucre 2-lobed in the native species, 3-lobed in some of the cultivated ones.

Involucre at base of receptacle 3-lobed or subentire. Cultivated Old World species.

Involucre subentire; receptacles oblong, longer than thick. Leaves elliptic-oblong, very thick, abruptly short-acuminate.
7. F. elastica Roxb.

Involucre 3-lobed; receptacles globose.

Leaves deltoid, with a very long cusp at apex, truncate at base, long-petiolate------------------------------------**8. F. religiosa** L.

Leaves obovate, with a short obtuse contracted apex.
9. F. nitida Thunb.

Involucre 2-lobed.

Leaves copiously pubescent beneath, oval or obovate, 10 to 25 cm. long. Receptacles 1.5 to 2 cm. in diameter-----**10. F. velutina** H. B. K.

Leaves glabrous beneath or nearly so.

Receptacles large, 1.5 to 2 cm. in diameter.

Leaves cuneate-obovate, acute at base.
11. F. involuta (Liebm.) Miquel.

Leaves oval or elliptic, rounded or subcordate at base.
12. F. urbaniana Warb.

Receptacles small, 5 to 10 mm. in diameter.

Receptacles sessile.

Receptacles 5 to 6.5 mm. in diameter; leaves abruptly acute or acuminate, with only 2 to 4 pairs of lateral nerves.
13. F. colubrinae Standl.

Receptacles 8 to 12 mm. in diameter; leaves rounded or obtuse at apex, with usually 5 to 7 pairs of lateral nerves.
14. F. costaricana (Liebm.) Miquel.

Receptacles pedunculate. Petioles glabrous.

Leaves oblong to ovate, 10 to 25 cm. long, rounded or subcordate at base, long-petiolate; receptacles 8 to 10 mm. in diameter.
15. F. hemsleyana Standl.

Leaves oblong-obovate, 4 to 11 cm. long, narrowed to the base, short-petiolate; receptacles 5 to 6 mm. in diameter.
16. F. oerstediana Miquel.

Of the species listed above the following are introduced and cultivated: *F. conora*, *F. elastica*, *F. religiosa*, *F. nitida*, and *F. urbaniana*. The others are native but some are occasionally found planted as shade trees. The edible fig, *Ficus carica* L., is probably not in cultivation, although there may be isolated individuals. It is seldom planted in Central America but is common in the drier parts of Mexico.

Of *F. conora* there are a few trees growing in Ancón. It is a native of the East Indies. The large fruits are borne in ample panicles along the trunk, a habit characteristic of numerous Old World species but not found among the American ones.

Ficus crassiuscula is a fine large tree, abundantly planted in Balboa and occurring also in the Atlantic forests. *F. elastica* is the rubber plant which is so common in cultivation as a pot plant in the United States. It is a native of the East Indies and is a popular shade tree in tropical America, often attaining a large size. *F. religiosa* is planted occasionally about the zone towns and in the parks of Panama City. Native of the East Indies, and a sacred tree of the Hindus, it is recognized easily by its poplarlike leaves, with very long narrow tips.

Ficus nitida also is an East Indian species. It attains a large size in some parts of tropical America and often assumes the banyan habit of growth. It is extensively planted in Balboa but the trees are small and do not seem to thrive. *F. urbaniana* is a native of the Lesser Antilles. A tree perhaps of this species is planted in Balboa near the Administration Building.

The wild figs are common everywhere about the zone, some of them reaching a large size. Here they do not seem to develop aerial roots and numerous trunks, like the banyan trees of India, as they do in some parts of Mexico and Central America. The tiny seeds often germinate upon branches of other trees, send down aerial roots, and develop long cordlike stems which finally envelop and strangle the host plant. For this reason the name "matapalo," tree-killer, is often applied to the strangler figs in Central America. For *F. hemsleyana* I was given at Frijoles the name "abraza-palo," which has a similar origin. The vernacular names used in Panama are "higo" and "higuero," the ordinary Spanish terms. The name "amate," an Aztec term of general use in Central America, is not employed here. *F. glabrata* is known locally as "higuerón."

The fruits of the wild figs are edible, but usually too small and dry to be palatable. The larger fruits, which are sweet and not unpleasant, are eaten by birds. The wood of the trees is soft and of no commercial value. It is doubtless for this reason that when land is cleared fig trees are usually left for shade. The milky sap yields a kind of rubber. From the bark the early Mexicans prepared paper.

6. CHLOROPHORA Gaud. Fustic

Chlorophora tinctoria (L.) Gaud., the only Central American species, is frequent in forests and thickets. The vernacular name in Panama as elsewhere in Central America is "mora" or "palo de mora." "Mora" is the Spanish word for mulberry. In Salvador the tree is called also "palo amarillo," in Costa Rica "brasil," and in some parts of Colombia "dinde."

The tree is well known as the source of fustic dyewood, which furnishes brown, yellow, and green dyes, and particularly the olive-drab of khaki. The wood is light yellow, close-grained, strong, and tough, taking a high polish, the specific gravity 0.70 or higher. It is employed for furniture, interior finish, cartwheels, and other purposes, and the bitter bark is used for tanning. Various medicinal properties are attributed to the tree in Central America.

Fustic is commonly a small tree, but sometimes 20 meters high, in general appearance somewhat resembling the closely related Osage-orange (*Toxylon pomiferum*). The branches are often, but not always, armed with sharp axillary spines. The leaves vary in outline like those of the red mulberry, being either coarsely toothed or deeply lobed. The staminate flowers are borne in long green catkins; the fruits, upon separate trees, are green, globose, about 1 cm in diameter, and contain numerous seeds.

7. **SOROCEA** St. Hil.

Sorocea affinis Hemsl. is an inconspicuous shrub or small tree, 3 to 6 meters high. The leaves are oblong or obovate-oblong, 7 to 18 cm. long, caudate-acuminate, entire or sinuate, and glabrous; the small red fruits are arranged in racemes. The species is known only from Panama.

8. **TROPHIS** L.

Trophis racemosa (L.) Urban is a common tree, 15 meters high or less. No vernacular name is reported from Panama, but in Mexico and Cuba it is known commonly as "ramón." The leaves are oblong to oval, 8 to 15 cm. long, abruptly acuminate or cuspidate, and entire. The staminate flowers are borne in green catkins; the fruits are 1 cm. or less in diameter and spicate.

In Yucatán, Cuba, and elsewhere the leaves and young branches are fed to stock, especially horses, and are said to be very nutritious. The fruit is edible, but the flesh is very scant.

9. **MORUS** L. MULBERRY

At least one small tree of the white mulberry, *M. alba* L., native of Europe, is planted in Balboa.

10. **INOPHLOEUM** Pittier

The only species of the genus is *I. armatum* (Miquel) Pittier. Originally described from Colombia, it has been collected in Panama in the Fató Valley in southern Darién, and at various places near the Canal. It is a tree of medium size, easily recognized by the numerous prickles on branchlets, petioles, leaf costa, and stipules. The leaves are normally rounded-ovate, but on small individuals often oblong.

By some of the Panama Indians the inner bark is soaked in water, then beaten with a wooden club to form a kind of cloth, which is the usual covering of the women among the Chocó, Cuna, and Guaymí Indians. The bark cloth serves also for hammocks and blankets, and in former times, at least, was made into sails for canoes. Bark cloth is made elsewhere from other trees of the mulberry family; in Costa Rica from species of *Brosimum* and *Castilla*, and in many parts of the world from fig trees. According to Pittier, *Inophloeum* is known in the Cupica district of Colombia as "namagua"; in Darién as "maragua"; and in the negro villages of the Atlantic coast of Panama as "cocuá."

11. **COUSSAPOA** Aubl.

Pistillate heads sessile or nearly so, the peduncles not branched; leaves deeply cordate at base........................1. **C. nymphaeifolia** Standl.

Pistillate heads on elongate branched peduncles; leaves rounded at base. 2. **C. panamensis** Pittier.

The species of *Coussapoa* are mostly small trees which are epiphytic upon other trees, especially wild figs. The leaves are broad, entire, and more or less white-tomentose beneath.

12. **PSEUDOLMEDIA** Trécul

One species, *P. spuria* (Swartz) Griseb., was reported from Lion Hill by Hemsley, but the determination may have been incorrect. It has not been collected recently in Panama.

13. **OLMEDIA** Ruiz & Pav.

Olmedia aspera Ruiz & Pav. is a slender shrub or small tree, 3 to 15 meters high. The leaves are short-petiolate, 12 to 35 cm. long, oblong or oblanceolate, long-cuspidate, sinuate-serrate, and very rough.

14. **CASTILLA** Cervantes. RUBBERTREE

The only true rubbertree native in the zone is *C. panamensis* Cook, which is frequent nearly everywhere in the forests. Usually seedlings are plentiful, indicating that reproduction is rapid. Trees planted in Ancón are probably *C. costaricana* Liebm., native of Costa Rica, distinguished by the close fine pubescence of the leaves and the short-pedunculate staminate inflorescences. *Castilla fallax* Cook, in which the leaf blades are rounded rather than cordate at base, occurs in Darién. This last species differs from the other Central American rubbertrees in the fact that it does not yield commercial rubber. The taxonomy of the American rubbertrees is not well understood, and it is uncertain how many species there really are. *C. panamensis*, for instance, is much like *C. elastica* Cervantes, of Mexico, and may be only a form of it.

The species of *Castilla* are the chief source of rubber in Mexico and Central America, and experiments in their cultivation have been conducted with varying success. There is no doubt that rubber can be produced in the region by cultivation, the only hindrance to development of the industry being lack of labor cheap enough to compete with that of the East Indies, which, fortunately for the general welfare of Central America, is lacking. Large amounts of rubber obtained from wild trees are exported from Central America, and it is rare to find a tree without the diagonal scars indicating that it has been tapped. The milky sap exuding from these cuts coagulates upon exposure to air, but various substances are added to it to hasten coagulation. In some localities the crushed stems of moonflower (*Calonyction*) are employed for the purpose.

In Panama the term "caucho," which means merely "rubber," is applied to the trees, while generally in Central America the term "hule" or "ule," an Aztec word, is given. The early inhabitants of the region were familiar with crude rubber, employing it to make balls for games, and bottles, and for waterproofing clothing.

The Panama *Castilla* is a large or medium-sized tree, which sheds its leaves during the dry season. The oblong leaves are about 30 cm. long, very rough above and hairy beneath. The fruiting receptacles become orange-red and are very showy, being produced in great profusion. The trees make good shade trees and are commonly planted about the fincas of Central America.

15. **PEREBEA** Aubl.

Perebea markhamiana (J. Collins) Pittier is a tree 6 to 12 meters high. The original specimens were collected on Lion Hill, and the tree occurs also on hills near Frijoles, where its name was given as "cerillo." The name "ule" also is reported. The receptacles in this genus are much like those of *Castilla*. The leaves are oblong, and about 30 cm. long, hairy beneath and glabrous above.

The only other Central American species is *P. castilloides* Pittier, of Chiriquí.

16. HELICOSTYLIS Trécul

Helicostylis latifolia Pittier was first collected at Alhajuela, occurs also in Darién, and is frequent about the zone in wet forests. It is a tree 20 meters high or larger, with elliptic or obovate leaves 4 to 9 cm. long. The local names were given me as "berbá," "choybá," and "querendo." The wood is said to be fine-grained and strong and to be employed sometimes for making canoes.

35. URTICACEAE. Nettle Family

Plants herbaceous. Flowers in cymes or panicles.
  Leaves opposite; plants without stinging hairs.
    Calyx of fertile flowers of 3 or 4 distinct sepals; small plants, not aquatic. 1. **PILEA.**
    Calyx of fertile flowers of united sepals; large coarse erect herb, growing in shallow water........2. **BOEHMERIA.**
  Leaves alternate; plants with stinging hairs........3. **FLEURYA.**
Plants woody.
  Leaves entire; flowers sessile in small clusters in the axils of the leaves. 4. **POUZOLZIA.**
  Leaves toothed or lobed; flowers in spikes, cymes, or panicles.
    Flowers in cymes or panicles; perianth present, fleshy at maturity; plants with stinging hairs........5. **URERA.**
    Flowers in long slender drooping spikes; perianth none; plants without stinging hairs........6. **MYRIOCARPA.**

The genus *Phenax* is represented in Panama. The plants of the family have simple petioled leaves. The flowers are very small and usually green, with a 2 to 5-lobed or parted perianth and no corolla. The fruit is an achene. The true nettles belong to the genus *Urtica*, of which there are species in Central America.

The hashish plant, *Cannabis sativa* L. (*C. indica* L. is a strain of this species) is cultivated clandestinely about the zone, and is employed sometimes in the region as a narcotic. The name "canyack" is sometimes given in Panama to the plant or its dried leaves. In Mexico the hashish plant is known as "marijuana." The hemp of commerce is obtained from this same species.

1. PILEA Lindl.

Leaves entire, 1 cm. long or less, the nerves obsolete.
  Largest leaves 5 mm. long or less........1. **P. microphylla** (L.) Liebm.
  Largest leaves about 10 mm. long........2. **P. serpyllacea** (H. B. K.) Liebm.
Leaves toothed, mostly 2 cm. long or larger, conspicuously nerved.
  Leaves orbicular or broader; plants creeping. 3. **P. nummularifolia** (Swartz) Wedd.
  Leaves mostly ovate, longer than broad; plants erect.
    Peduncle of the inflorescence longer than the petioles; leaves pubescent beneath........4. **P. pubescens** Liebm.
    Peduncles shorter than the petioles; leaves glabrous beneath. 5. **P. hyalina** Fenzl.

Both *P. hyalina* and *P. pubescens* are scarce, and the latter has been found only near Gatún. *P. microphylla* is occasional on moist banks, in gardens, or especially on old masonry. It is a small (usually 5 to 15 cm. high) much-branched plant with crowded fleshy leaves. It is often seen in greenhouses in the United States, being usually known as artillery plant, a name given because of the fact that when a flowering plant is touched the anthers eject the pollen with considerable force. In Salvador the plant is called "palma del norte." *P. serpyllacea* is grown as a houseplant about the zone, and is called here" laceplant." *P. nummularifolia* has been noted only in a garden in Balboa, where it is an abundant weed. It has probably been introduced from the West Indies.

2. **BOEHMERIA** Jacq.

B. cylindrica (L.) Swartz grows in shallow water about the shores of Gatún Lake. It is an erect herb with ovate toothed leaves, the flowers in dense clusters arranged in long interrupted spikes.

3. **FLEURYA** Gaud.

Fleurya aestuans (L.) Gaud., common in moist places, at least on the Pacific slope, is a succulent herb 1 meter high or less, provided with slender stinging hairs, and with long-petioled, broadly ovate, coarsely toothed leaves. It is known here as "ortiga," the general Spanish term for nettle.

4. **POUZOLZIA** Gaud.

Leaves very oblique at base, on petioles 1 cm. long or shorter.
1. P. obliqua Gaud.
Leaves not oblique at base, on slender petioles 2 to 8 mm. long.
2. P. occidentalis Wedd.

The plants are slender shrubs 1 to 2.5 meters high, with entire, pubescent, ovate to oblong leaves. The flowers are monoecious, greenish, and clustered in the axils of the leaves. *P. obliqua* is very common, but *P. occidentalis* has been found here only on Taboga Island.

5. **URERA** Gaud.

Leaves deeply pinnate-lobed........................... **1. U. laciniata Wedd.**
Leaves crenate or dentate, ovate or rounded-ovate, usually cordate at base.
  Achene over 2 mm. long; leaves coarsely and distantly sinuate-dentate; branches with numerous stout spinelike stinging hairs.
  2. U. baccifera (L.) Gaud.
  Achene less than 2 mm. long; leaves finely and closely crenate-dentate or subentire; branches usually unarmed, but petioles and inflorescence often with slender stinging hairs.
    Leaves broadly ovate to orbicular-ovate, usually cordate at base.
    3. U. caracasana (Jacq.) Griseb.
    Leaves rhombic-elliptic to elliptic-oblong, rounded at base.
    4. U. elata (Swartz) Griseb.

The plants are shrubs or small trees with large long-petioled leaves, the flowers usually dioecious, in axillary cymes or panicles. The achene is surrounded by a fleshy calyx resembling a berry.

U. laciniata is reported as collected by Seemann at Las Cruces but it has not been noted by recent collectors. *U. microcarpa* Wedd. also has been reported from the region and may occur here.

U. caracasana is rather frequent. It has small orange fruits. In Guatemala, Nicaragua, and Salvador it is known as "chichicaste;" in Mexico as "ortiga," "quemador," "mal hombre," and "mala mujer."

U. baccifera is common about the zone. It is one of the most troublesome plants of Central America, and one must be constantly on guard against it when in the forests. The stout hairs cause intense pain when they enter the flesh, the pain and inflammation sometimes lasting for several days. The shrub is planted for hedges in parts of Central America and certainly makes an effective barrier against man. The calyx is white and juicy at maturity. In Panama and Porto Rico the plant is known as "ortiga"; in Salvador, Guatemala, and Mexico as "chichicaste"; in Salvador as "nigua" or "nigüilla," a name given because of the resemblance of the fruits to the nest of the chigger or nigua; in Porto Rico as "ortiga brava"; and in Colombia and the Dominican Republic as "pringamoza."

U. elata, a tree of 6 to 9 meters, has been found here only on Barro Colorado Island.

6. MYRIOCARPA Benth.

Myriocarpa yzabalensis (Donn. Smith) Killip is a shrub or small tree, 2 to 6 meters high, common in moist forest and thickets. The large leaves are mostly ovate or obovate, long-petioled, closely crenate-serrate, and glabrate. The flowers are borne in very slender, panicled, drooping, threadlike, white spikes as much as 60 cm. long.

36. PROTEACEAE. Protea Family

Ovules orthotropous; leaves simple or pinnate, the leaflets toothed or nearly entire........................1. **ROUPALA.**
Ovules amphitropous; leaves pinnate, the leaflets deeply lobed..2. **GREVILLEA.**

This family is represented best in Australia and South Africa, there being few American species. The only genera represented in Central America by native plants are *Panopsis*, with one species, and *Roupala*, with four. The leaves are alternate, without stipules, the perfect flowers racemose, in pairs along the rachis. The perianth is 4-parted, and there are 4 stamens. The fruit is a woody follicle.

1. ROUPALA Aubl.

The only species about the zone is *R. darienensis* Pittier, of which *R. panamensis* Pittier is a synonym. It is probable that *R. darienensis* also should be reduced to synonymy under *R. complicata* H. B. K., which ranges from Costa Rica into northern South America.

Our Panama species is usually a shrub or small tree, but is said sometimes to attain a height of 30 meters. The leaves on older branches are ovate, acuminate, serrate, and long-petioled, but on small shrubs or even on trees they are pinnate. The small flowers are yellowish white. When broken the branches exhale an offensive skunklike odor. In Costa Rica the vernacular names applied are "ratoncillo," "zorrillo," and "danto hediondo."

2. GREVILLEA R. Br.

Grevillea robusta Cunn., the silk-oak, native of Australia, is occasionally planted for ornament. It is a popular shade tree in some parts of Central America, although not a very attractive one, except when in flower. The fernlike leaves are silky beneath. The large racemes of orange flowers are rather showy.

37. LORANTHACEAE. Mistletoe Family

Flowers immersed in the rachis of the spike.
  Perianth simple, no corolla present..............1. **PHORADENDRON.**
  Perianth double, both corolla and calyx present......2. **ORYCTANTHUS.**

Flowers not immersed in the rachis of the spike.

Filaments subulate……………………………………3. **STRUTHANTHUS.**

Filaments thick, truncate at apex……………………………4. **PHTHIRUSA.**

Several genera besides those listed here are represented in Central America. In some of them the flowers are large and red, but in the mistletoes of the zone the flowers are small and greenish. The leaves are opposite and entire, usually thick and fleshy, the fruit a one-seeded berry or drupe with very sticky pulp.

The mistletoes are the only true parasitic flowering plants found upon trees in the zone. They have woody branched stems and draw their nutriment directly from the host plant, with which they are united.

1. PHORADENDRON Nutt. MISTLETOE

Scales present at the base of each joint of the branches; stems terete; leaves lanceolate or ovate, acute or acuminate, pinnate-nerved; fruit yellow or orange……………………………………1. **P. piperoides** (H. B. K.) Trel.

Scales present only on the lowest joint of each branch; stems 4-angled; leaves oblong or lance-oblong, obtuse or rounded at apex, the nerves rising from the base of the blade; fruit yellow……………2. **P. venezuelense** Trel.

Several other species occur in distant parts of Panama. *P. piperoides*, widely dispersed in tropical America, is known in Salvador as "matapalo" and in Guatemala as "liga." Species of this genus are the common mistletoes of the United States. The European mistletoes belong to the genus *Viscum.*

2. ORYCTANTHUS Eichler

Leaves sessile, with somewhat clasping bases, broadly ovate, 7 to 14 cm. long, acuminate to obtuse, often cordate at base. Flowers perpendicular to the axis of the rachis……………………………1. **O. cordifolius** (Presl) Urban.

Leaves short-petiolate, not clasping.

Bracts of the flowers with free margins; flowers inserted perpendicular to the rachis; leaves oval to broadly ovate, obtuse or rounded at base and apex.
2. **O. occidentalis** (L.) Eichler.

Bracts with their margins partly united with the rachis; flowers inserted obliquely upon the rachis; leaves oval or ovate, rounded at base and apex.
3. **O. spicatus** (Jacq.) Eichler.

Only these species are known from Central America. They form large masses upon trees, and have very heavy, thick leaves, which are often bronze when first developed. *O. cordifolius* is known in Salvador as "hierba del pájaro."

3. STRUTHANTHUS Mart.

Struthanthus orbicularis (H. B. K.) Blume, the only species found about the zone, is widely distributed in South and Central America. It grows in large clumps upon trees, the stems being pendent, often a meter long or more, and sometimes inclined to twine. The leaves are orbicular or rounded-obovate, rounded or obtuse at apex, and petioled. The small flowers are yellowish green, the fruit oval, red, about 1 cm. long. On Taboga Island the plant is called "hierba de pajarito"; in Guatemala "matapalo" and "liga," and in Salvador "hierba del rosario."

Another species, *S. polystachyus* (Ruiz & Pav.) Blume, with oblong-lanceolate acuminate leaves, has been collected along the Río Fató, and may be found about the zone.

4. PHTHIRUSA Mart.

Flower spikes simple, brown-furfuraceous; leaves oblong or oblong-ovate, obtuse.
1. P. pyrifolia (H. B. K.) Eichler.
Flower spikes branched, glabrous; leaves broadly ovate, acute or acuminate.
2. P. theobromae (Willd.) Eichler.

Both species, which are the only ones known from Central America, are rather frequent about the zone, forming large, erect or pendent clumps. *P. theobromae* has red fruit. *P. pyrifolia* is known in Salvador as "matapalo."

38. OLACACEAE. Olax Family

Calyx accrescent and saucer-shaped in fruit, bright red; plants unarmed.
1. HEISTERIA.
Calyx not accrescent in fruit, green; plants armed with spines__**2. XIMENIA.**

The genus *Schoepfia* is known in Panama. The members of the family are shrubs or small trees with alternate entire leaves without stipules. The small axillary flowers have a 4 to 6-toothed or 4 to 6-parted calyx, a corolla with 4 to 6 lobes or petals, and as many or twice as many stamens as corolla segments. The fruit is a drupe.

1. HEISTERIA Jacq.

Pedicels much longer than the fruiting calyx. Leaves elliptic or oblong-elliptic, 8 to 12 cm. long, 3 to 6 cm. wide, acute at base__**1. H. longipes** Standl.
Pedicels shorter than the fruiting calyx.
  Leaves linear-lanceolate, 12 to 24 cm. long, 1.5 to 2.5 cm. wide.
2. H. costaricensis Donn. Smith.
  Leaves oblong-elliptic, 9 to 21 cm. long, 3.5 to 6 cm. wide.
3. H. macrophylla Oerst.

All these species seem to be rare in the zone. They are slender shrubs growing in the forest. The calyx in age is rotate and deep red, the fruit an oval or globose, dark blue drupe. *H. longipes* is known only from specimens collected along the Trinidad River; the other species are occasional on the Atlantic slope. *H. macrophylla* is called "ajicillo" in Panama, and in Salvador "sombrerito" and "cresta de gallo."

2. XIMENIA L. TALLOWWOOD

Ximenia americana L., the only Central American species, is a common shrub of the zone. It is armed with stout spines, the leaves are short-petioled, oblong to elliptic, 3 to 7 cm. long, rounded to obtuse at apex, and entire, and the fragrant, yellowish white flowers are borne in small cymes in the axils of the leaves. The corolla is 4-lobed and densely hairy within, the fruit a yellow drupe about 1.5 cm. long, with acid edible flesh. In Florida and the British West Indies the shrub is known as "tallowwood" and "hogplum." In Salvador it is called "pepenance" and "manzanillo"; in Nicaragua "chocomico." The close-grained yellow wood is said to have been employed as a substitute for sandalwood (*Santalum*), which it somewhat resembles.

39. ARISTOLOCHIACEAE. Birthwort Family

A single genus of the family occurs in Central America.

1. ARISTOLOCHIA L.

Leaves 3-lobed. Large vine; stipules large, persistent.......1. **A. trilobata L.**
Leaves entire.
  Stems hirsute or pilose. Large vine; leaves deeply cordate at base.
    2. **A. pilosa H. B. K.**
  Stems glabrous or merely puberulent.
    Leaves broadly ovate-cordate or deltoid, broadest near the base. Vines.
      Leaves deeply cordate at base, green beneath...3. **A. inflata H. B. K.**
      Leaves truncate or subcordate at base, pale beneath.
        4. **A. sylvicola Standl.**
    Leaves oblong to obovate, broadest at or above the middle.
      Plants scandent; leaves green beneath, rounded at base.
        5. **A. maxima L.**
      Plants erect; leaves glaucous beneath, acute at base.
        6. **A. panamensis Standl.**

The plants are mostly vines, herbaceous or woody, with petioled, entire or lobed, alternate leaves having stipules. The perfect flowers are very irregular, the perianth consisting of a tube, which is usually inflated below, and a broad spreading limb, which is usually brown, greenish, or dark purple. The fruit is a capsule and normally 6-celled.

A. grandiflora Swartz has been collected at Fató and may occur about the zone. It is sometimes grown in the United States under the names "duck-flower" and "pelicanflower," the calyx in its form suggesting a duck, and being of about the same size. The flower is probably larger than in any other Central American plant, the limb of the calyx being tipped with a pendent taillike appendage 15 to 45 cm. long.

A. panamensis, known only from Panama, is frequent in wet forest. *A. sylvicola* also is an endemic species, found thus far only on hills near Frijoles and on Barro Colorado Island. *A. trilobata* is said to have been collected by Fendler near Chagres, but has not been detected recently. *A. inflata* is frequent on the Pacific slope; *A. pilosa* has been collected only on the Atlantic watershed. The latter species is known in Guatemala as "sombrerito" and "hediondilla." For *A. maxima* I was given the name "bejuco loco." This species is known as "guaco" in Guatemala, Salvador, Colombia, and Venezuela; as "canastilla" in Salvador and Mexico; and as "farolito" in Mexico. The name "guaco" is one given usually to plants which are considered remedies for snake bites.

40. POLYGONACEAE. Buckwheat Family

Plants climbing, with tendrils. Sepals 3, cordate, deep pink, the flowers showy.
  1. **ANTIGONON.**
Plants not climbing, without tendrils.
  Plants herbaceous. Leaves narrowly lanceolate, long-acuminate; flowers perfect, white or pink, in racemes...............2. **POLYGONUM.**
  Plants trees or shrubs.
    Flowers perfect; calyx succulent at maturity, not longer than the achene.
      3. **COCCOLOBA.**
    Flowers dioecious; calyx dry, at maturity purplish red, 3 of the lobes spatulate, 5 cm. long, many times exceeding the achene..4. **TRIPLARIS.**

The plants of this family are easily recognized by the alternate entire leaves with sheathing stipules. The perianth consists of 4 to 6 green or colored segments and the fruit is a 2 or 3-angled achene, like that of buckwheat, which is one member of the family.

Sterile specimens apparently referable to the genus *Ruprechtia* have been collected at Darién Station.

1. ANTIGONON Endl. CORALVINE

Antigonon leptopus Hook. & Arn. is cultivated commonly, and has become more or less naturalized about Balboa. It is a native of western Mexico, but is widely cultivated in tropical America, and as far north as Florida, where it is called "Confederate vine." It is a large, herbaceous or suffrutescent vine, climbing by tendrils at the ends of the racemes. The bright pink flowers, borne in great profusion, are very showy. The leaves are deltoid-cordate, acute or acuminate, and petioled. Coralvine is the name applied to the plant in the zone. The Spanish names here are "coralito," "enredadera," and "cadena de amor." In other parts of Central America the names "colación," "confite," and "bellísima" are given to this and related species.

2. POLYGONUM L. SMARTWEED

Stems hispid; ocreae (stipule sheaths) with spreading herbaceous margins; racemes dense; sepals not punctate__________1. **P. hispidum** H. B. K.

Stems glabrous; ocreae brown, closely appressed; racemes slender, interrupted; sepals punctate______________________________2. **P. punctatum** Ell.

Polygonum hispidum has been collected only at Gatuncillo, but *P. punctatum* is rather common in shallow water about Gatún Lake. The latter is one of the common smartweeds of the southern United States. In some parts of Central America it is known as "chilillo" and "chile de perro."

3. COCCOLOBA L.

Calyx lobes accrescent in age and inclosing the fruit; pedicels not elongate in fruit. Leaves oval or suborbicular, finely puberulent beneath or glabrate. 1. **C. caracasana** Meisn.

Calyx tube accrescent and inclosing the fruit; pedicels usually elongate in fruit.
  Leaves orbicular or nearly so, fully as broad as long__2. **C. uvifera** (L.) Jacq.
  Leaves not orbicular, longer than broad.
    Leaves finely puberulent beneath, or barbate along the costa.
      Leaves oblong-lanceolate, long-acuminate, barbate beneath along the costa______________________________3. **C. acuminata** H. B. K.
      Leaves obovate or broadly obovate, acute or very shortly acuminate, puberulent beneath, not barbate along the costa. 4. **C. nematostachya** (Griseb.) Lindau.
    Leaves glabrous beneath.
      Leaves obovate, broadest above the middle__5. **C. manzanillensis** Beurl.
      Leaves oblong to oval or ovate, broadest at or below the middle.
        Leaves thin, the lateral nerves stout and conspicuous. 6. **C. leptostachya** Benth.
        Leaves thick, the lateral nerves slender and inconspicuous. 7. **C. padiformis** Meisn.

Coccoloba caracasana, a common tree about the zone, is handsome because of its low round crown and large stiff leaves. The racemes are usually pendent. In age the calyx becomes white and very thick and juicy, resembling a translucent berry. In this state it is much eaten in the parts of Central America where it grows, and is fairly palatable. The local name about the zone is "uvero," a term used also in Venezuela. The name "papaturro" is applied in Salvador and Costa Rica, and in the former country the tree is known also as "papalón" and "paparrón." There are trees of this species planted for shade in Ancón.

C. uvifera (pl. 24) is the well-known seagrape, which is widely distributed in tropical America, extending northward to Florida. It grows along sea beaches, and in the zone seems to occur only on the Atlantic side, where it is a dense rounded shrub or small tree, usually branched to the base. The handsome leaves are 10 to 20 cm. wide, very thick and stiff, and nearly sessile. Oviedo states that in early days in the West Indies the Spaniards employed the leaves as a substitute for letter paper, impressing characters upon the smooth surface with a pin. The hard, dark brown wood (specific gravity about 0.96) is valuable for cabinet work when of sufficient size. The fruit, as in some other species, is edible, and in the West Indies a fermented alcoholic drink has been made from it. The name "uva de la playa" (sea grape) is said to be given in Panama as well as in other regions. In Costa Rica the name "papaturro" also is used, and in Mexico "uva," "uvero," and "manzano."

C. acuminata is a shrub 3 to 4 meters high, of the forests of the Atlantic watershed. *C. nematostachya* is a small tree to which the name "hueso" is given. *C. manzanillensis*, originally described from Manzanillo Island, is frequent about Bella Vista, where it is a tree of 5 to 10 meters. *C. leptostachya* is a tree of the same size. It sheds its leaves during the dry season, and the new leaves are at first bright purplish red, making the trees very conspicuous. *C. padiformis*, which has been collected only along the Río Indio de Gatún, is described as a tree of 20 meters.

4. TRIPLARIS L.

The only Central American species, *T. americana* L., is a rather common tree about the zone. It is usually 6 to 10 meters high, the leaves oblong to elliptic, 20 to 35 cm. long, acuminate, glabrate in age. The dioecious flowers are arranged in large panicled racemes, the staminate ones inconspicuous, but the pistillate purplish red and very showy, appearing about February 1 and lasting several weeks. The fruiting calyx is 5 cm. long, with 3 spatulate obtuse divisions. When mature, the nutlike fruit falls with the calyx, and like a small parachute spins to the ground. When in flower and fruit the trees form masses of bright color that are visible at a great distance. The white fine-grained wood is useful for construction purposes. The hollow branches are frequently inhabited by ants, hence the name "hormigo" given in Costa Rica. The ants are usually a *Pseudomyrma*, and they maintain a complex symbiotic association, with coccid "cows," which supply them with food, and with nematodes that serve as sanitarians.

In Panama the tree is sometimes known as "palo santo" (a name given more commonly to *Erythrina glauca*), but oftener as "guayabo hormiguero," while in Salvador it is called "mulato" and "palo mulato."

Several fine trees of this species are growing near the Administration Building in Balboa.

41. CHENOPODIACEAE. Goosefoot Family

The beet, *Beta vulgaris* L., is sometimes grown about the zone. Its Spanish name is "remolacha." The family is poorly represented in Central America, three species of *Chenopodium* being the only members native there.

1. CHENOPODIUM L.

Chenopodium ambrosioides L. is an abundant weed in many parts of Central America, but about the zone I have seen it only in gardens, where it was planted for medicinal use. The name "paico" was given for it, but usually in Central America it is known as "epazote" or "apazote," an Aztec term. It is an ill-scented herb, a common weed in many parts of the United States. The seeds, wormseed or Mexican wormseed, are an effective vermifuge.

42. AMARANTHACEAE. Pigweed Family

- Leaves alternate.
  - Ovules 2 or more; flowers white or red........................1. **CELOSIA.**
  - Ovule 1; flowers green.
    - Seed with an aril; plants perennial, suffrutescent, usually scandent. 2. **CHAMISSOA.**
    - Seed without an aril; plants annual, usually erect....3. **AMARANTHUS.**
- Leaves opposite.
  - Anthers 4-celled; flowers in small spicate clusters, the clusters reflexed in age.
    - Flowers partly sterile; sepals of fertile flowers with hooked spinelike tips. 4. **CYATHULA.**
    - Flowers all fertile; sepals never with hooked tips....5. **ACHYRANTHES.**
  - Anthers 2-celled; flowers in heads or spikes, never in reflexed clusters.
    - Sepals with winglike crests. Annual herbs; flowers in headlike spikes. 6. **GOMPHRENA.**
    - Sepals not crested.
      - Stigma capitate or obscurely 2-lobed.
        - Lobes of the stamen tube entire; herbs; sepals glabrous or pilose with short hairs............................7. **ALTERNANTHERA.**
        - Lobes of the stamen tube lobed or toothed; climbing shrub; inner sepals with long silky hairs twice as long as the sepals....8. **PFAFFIA.**
      - Stigma with 2 or 3 subulate lobes. Herbs.
        - Flowers not compressed, in small spikelets, these loosely panicled; perianth sessile; plants not fleshy..................9. **IRESINE.**
        - Flowers compressed, in dense headlike spikes, these solitary; fleshy plant of seashores.........................10. **PHILOXERUS.**

Besides the genera listed, *Pleuropetalum*, the only other Central American genus, occurs in Panama. The Amaranthaceae are mostly weedy plants of no special interest or importance.

1. CELOSIA L. Cockscomb

Celosia argentea L. is rarely found as a weed. It is the primitive form of which *C. cristata* L., the garden cockscomb, is a variety. Cockscomb is cultivated for ornament in Panama gardens, being known as "abanico" (fan). In some parts of Central America the names "cresta de gallo" (cock's comb), "borla," "terciopelo," and "San José" are applied to it.

2. CHAMISSOA H. B. K.

Chamissoa altissima (Jacq.) H. B. K. is a common plant in thickets. It is suffrutescent and usually scandent.

3. AMARANTHUS L. Pigweed

Plants armed with axillary spines........................1. **A. spinosus** L.
Plants unarmed.
  Fruit (utricle) rugose, indehiscent......................2. **A. gracilis** Desf.
  Fruit smooth, dehiscent.
    Sepals equaling or longer than the fruit; flower spikes pale green.
      3. **A. dubius** Mart.
    Sepals shorter than the fruit; spikes usually red or purple.
      4. **A. cruentus** L.

Amaranthus gracilis, collected at Balboa, is doubtless introduced, and is probably native in the Old World tropics. *A. cruentus,* called "abanico chino" (Chinese fan) and "calalú," is planted for ornament and as a pot herb. *A. spinosus* is a common weed which is widely dispersed in the Tropics and in many parts of the United States.

To all the species the names "bledo" and "calalú are given in Panama. The latter is probably of West Indian origin, since in Central America it seems to be used only along those parts of the Atlantic coast where there are many West Indians. The young tender shoots of *A. dubius* and *A. cruentus* are much used in Panama for "greens," just as other species are employed in the United States. In Mexico, as well as in Guatemala and Salvador, the Aztec name "quelite" is applied to these and other plants employed as pot herbs. The English name of *A. cruentus* is "blood amaranth."

4. CYATHULA Lour.

Sepals 2 mm. long; hooked segments of the sterile flowers 12 to 20, equaling the sepals.................................1. **C. prostrata** (L.) Blume.
Sepals 3 to 4 mm. long; sterile segments 3 to 6, in age twice as long as the sepals.
  2. **C. achyranthoides** (H. B. K.) Moq.

Cyathula achyranthoides is a native species; *C. prostrata* is introduced from the Old World Tropics. Both are known in Panama as "cadillo," a name given here to any plant with small burlike fruit. The flowers of both species adhere tenaciously to clothing by the hooked spines of the sterile flowers.

5. ACHYRANTHES L.

Achyranthes indica (L.) Mill. is a common weed. The reflexed flowers with their sharp-pointed segments penetrate the skin readily if one's hand is brushed along the spikes. The leaves are rounded at apex. *A. aspera* L., with acute leaves, a common weed in some parts of Mexico and Central America, has not been collected thus far in Panama.

6. GOMPHRENA L. Globe-amaranth

Flower heads 9 to 13 mm. in diameter, white............1. **G. dispersa** Standl.
Flower heads 20 to 25 mm. in diameter, white, yellow, or red..2. **G. globosa** L.

The common globe-amaranth or "bachelors-button," *G. globosa,* so often seen in gardens in the United States, is grown for ornament also in Panama, and is found occasionally as an escape in waste ground. Its native country is not known definitely. It is known in Panama as "siempreviva" (everlasting) and "suspiro." *G. dispersa* is a common weed in tropical America. No vernacular name for this species was learned in Panama, but in Salvador it is known as "sanguinaria" and in Guatemala as "botoncillo."

7. **ALTERNANTHERA** Forsk.

Flower heads pedunculate........................1. **A. williamsii Standl.**
Flower heads sessile.
  Utricle obcordate, equaling the sepals; heads 3 mm. thick; sepals glabrous.
    2. **A. sessilis** (L.) R. Br.
  Utricle not obcordate, much shorter than the sepals; heads 4 to 5 mm. thick or larger; sepals pilose.
    Pubescence of branches of hispidulous hairs; sepals with rigid spinose tips.
      3. **A. ficoidea** (L.) R. Br.
    Pubescence of simple hairs; sepals with soft acute tips.
      4. **A. polygonoides** (L.) R. Br.

The last three species are common tropical weeds. *A. williamsii* is an abundant large herb, erect or clambering. A form of it with handsome purple-red leaves (*A. williamsii* f. *purpurea* Standl.) is frequently cultivated for ornament in Panama, and is sometimes found wild. Several species besides those listed grow in other parts of Panama.

8. **PFAFFIA** Mart.

Pfaffia hookeriana (Hemsl.) Greenm., the only North American species, a woody vine, has been collected at Gatuncillo.

9. **IRESINE** P. Br.

Flowers polygamous; upper leaves usually linear-lanceolate; leaves turning dark when dry..................1. **I. angustifolia** Euphr.
Flowers dioecious; upper leaves usually ovate or ovate-lanceolate; leaves yellowish green when dry..................2. **I. celosia** L.

Iresine celosia is one of the most common weeds of Central America. *I. angustifolia* grows usually in thickets near the seashore. On Taboga Island the name "cadillo" was given for it, but that name is scarcely applicable.

10. **PHILOXERUS** R. Br.

The only North American species, *P. vermicularis* (L.) R. Br., is a fleshy plant with heads of white flowers resembling those of *Gomphrena*. In the zone it occurs on the beaches of the Atlantic coast.

43. NYCTAGINACEAE. Four-o'clock Family

Leaves alternate. Large woody vine, armed with spines; flowers in clusters of 3, each flower borne upon a large colored bract......1. **BOUGAINVILLEA.**
Leaves opposite.
  Plants trees or shrubs; embryo straight; flowers dioecious.
    Plants armed with spines; fruit club-shaped, 5-angled, with numerous stalked glands along each angle..................2. **PISONIA.**
    Plants unarmed; fruit oblong, terete, without glands.
      Stamens exserted..................3. **TORRUBIA.**
      Stamens included..................4. **NEEA.**
  Plants herbaceous.
    Flower subtended by a calyx-like involucre of united bracts; fruit terete; flowers large and showy..................5. **MIRABILIS.**
    Flowers subtended by distinct, small, and inconspicuous bracts; fruit angled or sulcate; flowers very small and inconspicuous..6 **BOERHAAVIA.**

The name Allioniaceae has been used for this group. The plants belonging here are of little general interest. In all the leaves are entire. The simple perianth is sometimes brightly colored so as to resemble a corolla.

1. **BOUGAINVILLEA** Commers. BOUGAINVILLEA

The common bougainvillea, *B. glabra* Choisy, native of Peru, is one of the most abundant ornamental plants of Panama. The usual names for it are "veranera" or "flor de verano," summer flower, in allusion to the fact that it blooms during the dry season or "summer," which occurs in the winter months of the North. The usual form with purple-red bracts is common here, also the finer variety with bright red bracts. There is also a form in which the bracts are of a beautiful pale pink. It should be noted that the flowers of Bougainvillea are small and inconspicuous, the large heart-shaped bracts being the organs that supply the color.

In Salvador the name "manto de Jesús" is given to the vine, and generally in Central America variations of the Latin name are in use.

The cultivated *Bougainvillea* is often referred to *B. spectabilis* Willd., and that species is in cultivation, but the common form in Central America is *B. glabra.*

2. **PISONIA** L.

Pisonia aculeata L. is rather frequent near the Pacific coast of the zone, and is widely distributed in tropical America, extending northward to Florida. It is a woody vine or small tree with long pendent branches, armed with stout recurved spines. The flowers are green, in dense cymes, the club-shaped fruit 9 to 12 mm. long, 5-angled, each angle furnished with numerous sticky glands. In Nicaragua the plant is called "espino negro;" in Salvador "cagalero;" in some parts of Mexico and in Cuba it is known as "uña de gato," cat-claw, an appropriate name.

3. **TORRUBIA** Vell.

Torrubia panamensis Standl., a species known only from Taboga Island and from thickets near Panama City, is a tree 5 to 12 meters high. The leaves are oblong-obovate, 5 to 10 cm. long, and acute or acuminate.

4. **NEEA** Ruiz & Pav.

Leaves mostly 2 to 4 cm. wide; branches of the inflorescence glabrous; large shrub or small tree, often 6 meters high..........1. **N. delicatula** Standl.

Leaves mostly 6 to 12 cm. wide; branches of the inflorescence rufous-puberulent; shrub 1.5 to 3 meters high......................2. **N. pittieri** Standl.

Neea pittieri is a frequent shrub in the forests near the Atlantic. *N. delicatula,* originally described from Alhajuela, and known only from Panama, occurs in thickets near Panama City.

5. **MIRABILIS** L. FOUR-O'CLOCK

Mirabilis jalapa L., the common four-o'clock, a well-known ornamental plant of the United States, is one of the favorite garden flowers in Panama, and grows also as a weed in waste ground. It is a native of tropical America, but, like so many other cultivated plants of American origin, is not known in the truly wild state. The showy flowers are purplish red, white, or yellow, and often streaked with two colors. They are very fragant and are closed during midday. The usual name in Central America is "maravilla," marvel or wonder, originally given in allusion to the variegated blossoms, but the name "buenas tardes," good after-noon, also is used for the plant in Panama. The specific name *jalapa* was given because of an erroneous belief that the plant was the source of the drug jalap, which is really obtained from the roots of a species of *Ipomoea*.

6. BOERHAAVIA L.

Fruit glabrous; flowers in loose cymes; plants annual, usually erect; perianth pink……1. **B. erecta L.**

Fruit viscid-pubescent; flowers in small heads or glomerules; plants perennial, usually procumbent; perianth dark red.

  Branches of the inflorescence glabrous; stems usually glabrous except at the nodes; flowers in clusters of 2 to 4……2. **B. coccinea Mill.**

  Branches of the inflorescence puberulent; stems copiously pubescent; flowers usually in many-flowered heads……3. **B. caribaea Jacq.**

These three species are the only ones found in Central America. Both *B. erecta* and *B. caribaea* are common weeds in the zone, but *B. coccinea*, which is rare in Central America, has been collected here only twice, on Taboga Island. The name "carasola" was given for it there.

44. PHYTOLACCACEAE. Pokeberry Family

Fruit of 7 or more carpels, juicy. Flowers racemose……1. **PHYTOLACCA.**

Fruit of a single carpel; flowers spicate or racemose.

  Fruit with 4 hooked bristles at apex; flowers spicate, appressed to the rachis of the spike……2. **PETIVERIA.**

  Fruit without bristles, tuberculate; flowers racemose, spreading on the reachis. 3. **MICROTEA.**

The three plants here listed are herbaceous or suffrutescent, with alternate entire petioled leaves. The flowers have no petals but the sepals are often petallike.

1. PHYTOLACCA L. Pokeberry

Phytolacca rivinoides Kunth & Bouché, common about the zone, is a coarse herb 1 to 1.5 meters high with long racemes of small, white or pinkish flowers on a carmine rachis. In general appearance it is exactly like the pokeweed of the United States. In the Changuinola Valley the plant is said to be called "calalú," and in Costa Rica, like other members of the genus, it is known as "jaboncillo." The roots are reported to be employed sometimes as a substitute for soap. In the United States young shoots of pokeberry (*P. americana*) are eaten in spring like asparagus, which they somewhat resemble, but apparently they are not eaten in Central America.

2. PETIVERIA L.

The single species of the genus, *P. alliacea* L., is a common Panama weed, an erect, herbaceous or suffrutescent plant which, when crushed, exhales a strong odor of garlic. It is stated that if cows eat the plant the flavor of garlic is imparted to their milk. In the West Indies the roots are placed among woolen goods to protect them from insects. The plant finds various applications in domestic medicine.

About the zone the name "anamú" is given to the plant, a term used also in Colombia, Cuba, and Porto Rico. In Salvador, Guatemala, and Nicaragua the names "ipacina" and "epacina" are used. The West Indians of the zone give to the plant the names "gully-root" and "guinea-hen weed," the former Barbadian, the latter Jamaican. They sniff the odor of a piece of the root to relieve headache, and employ a decoction of the plant as a remedy for pain in the back and other ailments. The sharp spines of the fruit penetrate the skin readily and painfully if the plant is handled carelessly.

3. MICROTEA Swartz

Microtea debilis Swartz, the only Central American species, is an insignificant annual weed.

45. AIZOACEAE. Carpetweed Family

Leaves in whorls of 5 or 6, not fleshy; sepals distinct or nearly so; capsule loculicidal. Annual ---------- 1. **MOLLUGO.**
Leaves opposite, fleshy; sepals united below; capsule circumscissile.
  Stipules present; ovary 1 or 2-celled; leaves rounded-obovate; annual. 2. **TRIANTHEMA.**
  Stipules none; ovary 3 to 5-celled; leaves oblong-linear; perennial. 3. **SESUVIUM.**

1. MOLLUGO L. CARPETWEED

Mollugo verticillata L., the only Central American species, and common in many parts of the United States, is reported by Hemsley as collected at Chagres by Fendler.

2. TRIANTHEMA L.

The only North American species, *T. portulacastrum* L., has been collected at Fort Clayton. In Salvador it is known as "verdolaga."

3. SESUVIUM L.

In Central America the only species is *S. portulacastrum* L., which is found on tidal flats on both coasts of the zone. In Sinaloa, Mexico, the plant is called "vidrillo."

46. PORTULACACEAE. Purslane Family

Ovary superior; petals purple; flowers in large terminal panicles -- 1. **TALINUM.**
Ovary partly or wholly inferior; petals yellow; flowers sessile at the ends of the stems ---------- 2. **PORTULACA.**

The plants are succulent herbs with opposite or alternate, entire leaves; the perfect regular flowers have 2 sepals and 4 or 5 petals, the stamens numerous or as many as the petals. The fruit is a small capsule, opening by a lid or by 3 valves.

1. TALINUM Adans.

T. paniculatum (Jacq.) Gaertn. has been found here as a weed, but is infrequent. It is a simple or branched, erect herb, 1 meter high or less, with chiefly obovate, petioled leaves.

2. PORTULACA L. PURSLANE

Portulaca oleracea L., the common purslane or pusley of the United States, is a frequent weed about the zone. It is a very fleshy, prostrate, glabrous annual with wedge-shaped alternate entire leaves. The small yellow flowers are sessile in the axils of the leaves. The capsule is circumscissile, its caplike top falling off like a lid. In Panama, as elsewhere in Central America and in Mexico, the plant is called "verdolaga." Throughout Central America it is much used as a vegetable, being cooked and eaten like spinach, just as it is employed in some parts of the United States.

47. SILENACEAE. Pink Family

The genera *Polycarpaea*, *Stellaria*, and *Arenaria* are represented in Panama, the last two only by mountain species.

1. DRYMARIA Willd.

Leaves glabrous..........1. **D. cordata** (L.) Willd.
Leaves pilose..........2. **D. villosa** Schlecht. & Cham.

The plants are slender procumbent annual weeds with rounded opposite leaves and minute stipules. The small flowers are borne in few-flowered cymes; the fruit is a 3-valved capsule. *D. cordata* is very common, but *D. villosa* has been found only as a weed in the Powell Orchid Garden in Balboa, the seeds perhaps brought with orchid plants from the mountains.

48. NYMPHAEACEAE. Waterlily Family

Sepals 4; petals numerous, white; leaves reniform, entire or dentate. 1. **CASTALIA.**
Sepals 3; petals 3, purple; leaves dissected into threadlike segments. 2. **CABOMBA.**

1. CASTALIA Salisb. WATERLILY

Leaves thin, entire, green beneath..........1. **C. blanda** (Meyer) Standl.
Leaves thick, dentate or undulate, purple beneath.
  Leaves coarsely and deeply dentate..........2. **C. ampla** Salisb.
  Leaves shallowly undulate-dentate..........3. **C. rudgeana** (Meyer) Britt. & Wils.

No other species of *Castalia* (sometimes called *Nymphaea*) are known from Central America. *C. blanda* (*N. blanda* Meyer) has been collected only on the Pacific slope, but the other species are frequent or abundant in quiet water. *C. ampla* has very handsome, large, white flowers. By the West Indians it is called "duckweed."

2. CABOMBA Aubl.

The only Central American species, *C. aquatica* Aubl., has been collected near Matías Hernández. It is a submerged or floating aquatic with small long-peduncled flowers.

49. MENISPERMACEAE. Moonseed Family

Staminate flowers with 4 sepals; ovary of a single carpel; leaves usually peltate. 1. **CISSAMPELOS.**
Staminate flowers with 6 sepals; ovary of 3 carpels; leaves not peltate.
  Endosperm present; leaves thin, cordate or truncate at base; stems herbaceous..........2. **ODONTOCARYA.**
  Endosperm none; leaves coriaceous, rounded at base; stems woody. 3. **HYPERBAENA.**

Sterile material of a large vine, perhaps referable to the genus *Sciadotenia*, has been collected on Barro Colorado Island. The plant is distinguished by having the peltate leaves covered beneath with a fine dense white tomentum. Another vine of the Atlantic slope is represented by imperfect material which it has not been possible to place generically.

The plants are small, woody or almost wholly herbaceous vines with broad entire alternate leaves, without stipules. The minute greenish flowers are dioecious; the fruits are small drupes.

1. CISSAMPELOS L.

Bracts of the inflorescence large and foliaceous in both staminate and pistillate cymes……………………1. **C. tropaeolifolia** DC.

Bracts of the staminate inflorescense much reduced or absent..2. **C. pareira** L.

The fruit in both species is red or orange. *C. pareira*, one of the most common plants of Central America, is abundant here. The thick bitter roots are used medicinally in Panama, and the plant is one of the numerous reputed remedies for snake bites. In most parts of Central America it is known as "alcotán," but in Costa Rica it is called also "bejuco azul" and "venadero"; in Nicaragua "picamano"; and in Venezuela "hierba ratón."

C. tropaeolifolia is not infrequent about the zone, but is much less common than *C. pareira*.

2. ODONTOCARYA Miers

Odontocarya nitida Riley is known only from Panama, where it seems to be rare. The leaves are densely pubescent beneath. The inflorescence is racemose, rather than cymose as in *Cissampelos*. *O. paupera* (Griseb.) Diels also occurs here.

3. HYPERBAENA Miers

H. panamensis Standl., an endemic species, is frequent in the Atlantic forests. It is a slender woody vine with ovate to oblong, acuminate, 3-nerved leaves.

50. ANNONACEAE. Custard-apple Family

Carpels of the fruit fused at maturity, forming a large, globose or ovoid, many-seeded fruit. Outer petals valvate……………………1. **ANNONA.**

Carpels distinct at maturity, usually stalked, each 1 or few-seeded.

  Outer petals imbricate in bud.

    Stamens densely crowded upon the receptacle, very numerous. 2. **GUATTERIA.**

    Stamens laxly imbricate, few (6 to 18)……………………3. **OXANDRA.**

  Outer petals valvate in bud.

    Outer petals erect and connivent in flower, oblong or linear. Shrubs or small trees with narrow distichous leaves; carpels of the fruit splitting open at maturity……………………4. **XYLOPIA.**

    Outer petals separated in the flower and often spreading, sometimes connivent but then broad, elliptic or ovate.

      Carpels of the fruit lopsided, splitting along one side at maturity. Shrub; outer petals linear-oblong……………………5. **ANAXAGOREA.**

      Carpels symmetric, indehiscent.

        Petals spreading in flower, linear-oblong; cultivated tree. 6. **CANANGIUM.**

        Petals erect in flower, broad; native species.

          Flowers borne on old naked branches…………7. **UNONOPSIS.**

          Flowers borne on young branchlets in the axils of leaves. 8. **DESMOPSIS.**

1. ANNONA L.

Flowers elongate, columnar and 3-angled in bud, with narrow petals. Leaves thin, sparsely and inconspicuously sericeous beneath.

  Leaves broadly obovate, abruptly acuminate, broadest above the middle; fruit smooth, subglobose, about 5 cm. long, with scant pulp. 1. **A. hayesii** Safford.

Leaves narrowly elliptic-oblong, gradually acuminate, broadest at the middle; fruit ovoid-globose, 7 to 13 cm. in diameter, with copious pulp, the surface divided by impressed lines into rhomboid or hexagonal areoles.
2. **A. reticulata** L.

Flowers globose or broadly pyramidal in bud, with brown petals.
  Petals 3, or 6 but the inner ones small or rudimentary.
    Leaves oblong-lanceolate, 6 to 9 cm. long, glabrous or nearly so. Fruit about 2.5 cm. in diameter, tuberculate ..... 3. **A. acuminata** Safford.
    Leaves elliptic-oblong, mostly 15 to 30 cm. long, densely soft-pubescent beneath. Fruit about 5 cm. long, densely covered with clawlike tubercles ..... 4. **A. spraguei** Safford.
  Petals 6, all large and broad.
    Inner petals valvate; petioles mostly 1.5 to 2 cm. long. Leaves glabrous; fruit smooth, glabrous ..... 5. **A. glabra** L.
    Inner petals imbricate; petioles usually less than 1 cm. long.
      Fruit covered with a feltlike tomentum and with densely set, angled tubercles; leaves broadly obovate, tomentose beneath when young, the tomentum persistent along the nerves; native species.
6. **A. purpurea** Moc. & Sessé.
      Fruit glabrous, smooth or with remote tubercles; leaves glabrous or obscurely sericeous beneath; cultivated species.
        Outer petals cordate at base; leaves elliptic-obovate; fruit very large, with stout fleshy spines ..... 7. **A. muricata** L.
        Outer petals rounded at base; leaves elliptic-oblong; fruit 10 to 13 cm. long, the areoles unarmed or with short protuberances.
8. **A. marcgravii** Mart.

Annona hayesii, a shrub or small tree, is common, especially on the Pacific slope. It is known only from Panama. *A. reticulata* (pl. 25) is known locally only from Taboga Island, where it is called "anón." It is one of the custard-apples so extensively planted in tropical America, but the fruit of this species is rather inferior. The sweetish pale tallowlike pulp is full of large seeds. In Central America the fruit is called usually "anón" or "anona"; in Porto Rico "corazón"; and in Venezuela "riñón."

A. acuminata is an endemic species, known only from the vicinity of the zone, where it occurs in wet forest. When fully ripe the fruit splits open, exposing the orange pulp and dark-brown seeds. The local name is "camarón." *A. spraguei* (pl. 26) also is endemic in Panama and is a common tree about the zone. It is called "negrito" and "chirimoya," and in Darién "chirimoyo de monte."

A. glabra grows usually near the coast, in swamps or wet forest, and is not common here. It has a wide range, extending northward to Florida. The English names are pondapple, alligator-apple, and monkeyapple. The fruit is insipid and useless for human food. The very light wood is sometimes used for corks and as floats for fish nets. At David the fruit is called "anón de puerco." In Guatemala it is called "anonillo," and in Porto Rico "cayur," "anón," and "corazón cimarrón."

A. purpurea (pl. 27) is common on the Pacific slope. Its fruit is of little value, the flesh being orange-colored and fibrous. The local name is "guanábana torete," and on Taboga the tree is called merely "guanábano." In Costa Rica the name is "soncoya"; in Salvador and Guatemala "sincuya" or "sencuya"; in Guatemala "matacuy"; in Mexico "cabeza de negro"; and in Venezuela "manirote."

A. muricata is the soursop, which is much planted in tropical America. The leaves are strongly scented when crushed. The spiny fruits are often as large as a child's head, and so heavy that they drag the branches to the ground. The juicy white subacid pulp is used chiefly for preparing beverages and ices. In Panama, as elsewhere in Central America, the name is "guanábana," a term often shortened to "guanaba."

A. marcgravii, a South American species, has been planted about Balboa and Ancón.

2. GUATTERIA Ruiz & Pav.

The only species occurring here is *G. amplifolia* Triana & Planch., a frequent shrub or small tree of the Atlantic forests. The leaves are oblong or elliptic, 20 to 30 cm. long, acuminate, and nearly glabrous. The large, green or yellowish flowers have 6 subequal leathery petals. The fruit is a cluster of numerous small oval berries borne on red stalks.

3. OXANDRA A. Rich.

The only Central American species, *O. laurifolia* (Swartz) A. Rich., occasional on the Atlantic slope, is a small tree with oblong acuminate glabrate leaves. The flowers have unequal oblong petals. The fruit is a cluster of 1-seeded, nearly sessile berries.

4. XYLOPIA L.

Corolla about 1 cm. thick; calyx over 1 cm. long.
1. **X. macrantha** Triana & Planch.

Corolla less than 4 mm. thick; calyx 5 mm. long or shorter.
  Flowers about 1 cm. long; leaves 1 to 1.5 cm. wide___2. **X. frutescens** Aubl.
  Flowers about 2.5 cm. long; leaves 2 to 3.5 cm. wide.
3. **X. xylopioides** (Dunal) Standl.

These species, the only ones known from Central America, are shrubs or small trees with spreading or pendent branches and distichous oblong-lanceolate long-acuminate leaves, silky-hairy beneath. The whitish flowers, clustered in the leaf axils, have long narrow petals. The fruit is a cluster of red berries which split open at maturity. *X. macrantha* is frequent on the Atlantic watershed, being known as "corobá" and "rayado." Both the other species are abundant here, especially on the Pacific slope, and both are known as "malagueto." *X. xylopioides* is called "malagueto macho" locally, and *X. frutescens* is called "malagueto hembra" at Olá. It is not uncommon in Central America to designate two similarly related species as "male" and "female."

5. ANAXAGOREA St. Hil.

Anaxagorea panamensis Standl. is known only from the forests along the Río Tapia and the hills near Frijoles, where it is frequent. It is a slender shrub 1 to 2 meters high with lance-oblong acuminate glabrous leaves. The pale yellow, axillary flowers have 3 long narrow petals and 3 short ones. The fruit is a cluster of long-stalked follicles, which split down one side, exposing the large seed.

6. CANANGIUM Baill. ILANG-ILANG

The ilang-ilang, *C. odoratum* (L.) King, native of the Malayan region, is planted in Balboa and Ancón. It is a small tree with oblong acuminate leaves, and axillary clusters of large yellow-green flowers, followed by a cluster of oblong greenish berries. The flowers have a penetrating and highly agreeable odor, which persists even in dried specimens. In the Philippines the flowers are distilled for the valuable perfume oil which they yield. The name is sometimes written "ylang-ylang."

7. UNONOPSIS R. E. Fries

The only Central American species, *U. pittieri* Safford, occasional in the forests of the Atlantic slope, is endemic in Panama. It is a tree with large oblong acuminate glabrate leaves. The fruit is a dense cluster of stalked, red or orange, globose berries.

8. DESMOPSIS Safford

Desmopsis panamensis (Robinson) Safford, occasional in the forests of the Atlantic slope, is a shrub or small tree with oblong-elliptic acuminate leaves, pubescent beneath. The long-stalked flowers are greenish yellow, the fruit a cluster of stalked oval pubescent berries. Another species occurs in Chiriquí.

51. MYRISTICACEAE. Nutmeg Family

Two other genera, *Dialyanthera* and *Compsoneura*, are represented in Panama. To the family belongs the nutmeg, *Myristica fragrans* Houtt., native of the East Indies.

1. VIROLA Aubl.

Anthers acute.................................1. **V. panamensis** (Hemsl.) Warb.
Anthers obtuse.......................................2. **V. warburgii** Pittier.

The plants are trees with alternate, short-petioled, oblong or lance-oblong, entire leaves, stellate-tomentose beneath. The small flowers, borne in axillary panicles, have a 3-lobed perianth and 3 to 6 stamens. The 1-seeded fruit has a fleshy or woody pericarp, and the seed is subtended by a beautiful lobed netlike aril. *V. panamensis* and *V. warburgii* (pl 28) are closely related and doubtfully distinct. They are frequent in the forests. *V. panamensis* is said to be called "malagueta de montaña," and the name "bogamani" is given to the trees of the genus.

52. MONIMIACEAE. Monimia Family

The genus *Mollinedia* is represented in Panama.

1. SIPARUNA Aubl.

Leaves glabrous or nearly so at maturity, oval-oblong...1. **S. guianensis** Aubl.
Leaves densely stellate-tomentose beneath at maturity, broadly elliptic or obovate-elliptic............................2. **S. pauciflora** (Beurl.) A. DC.

Other species occur elsewhere in Panama. The plants are strong-scented shrubs or small trees with opposite short-petioled leaves, entire or obscurely dentate, and without stipules. The small greenish flowers are monoecious or dioecious, in small axillary cymes; the fruit is a drupe. *S. guianensis*, known locally as "hierba de pasmo," is said to be employed as a remedy for colic, and to kill vermin on fowls.

53. LAURACEAE. Laurel Family

Sepals very unequal, the outer ones shorter. Fruit usually over 6 cm. long. 1. **PERSEA.**
Sepals equal or nearly so.
  Staminodia of the inner series of stamens well developed, sagittate.
    Perianth persisting entire below the fruit; native trees.........2. **PHOEBE.**
    Perianth deciduous, or the segments split after flowering; introduced species. 3. **CINNAMOMUM.**
  Staminodia of the inner series of stamens none or minute and stipelike.
    Anther cells in pairs, one pair above the other...............4. **OCOTEA.**
    Anther cells all inserted at nearly the same height......5. **NECTANDRA.**

Other genera probably are represented in Panama. The plants are shrubs or trees with alternate persistent entire leaves, without stipules. The small flowers have a 6-lobed perianth. There are normally twice as many stamens and staminodia as perianth segments, and they are arranged in 2 or 4 series, the anthers being erect and 2 or 4-celled. The fruit is drupelike, 1-seeded, surrounded at base by the persistent calyx tube, the whole often suggestive of an acorn. The family is a difficult one, with little variation in foliage. In order to determine the species or genus it is necessary to dissect the small flowers.

The most widely known representative of the family in the United States is sassafras, *Sassafras variifolium* (Salisb.) Kuntze. The European laurel, *Laurus nobilis* L., belongs to the family.

1. **PERSEA** Gaertn.

Fruit large, edible------------------------------------1. **P. americana** Mill.
Fruit small, globose, less than 1 cm. in diameter.
2. **P. caerulea** (Ruiz & Pav.) Mez.

P. americana, the avocado or "alligator pear," is planted about the zone, and also is naturalized around old settlements. It is a native of tropical America, but is cultivated in most tropical and subtropical regions. In recent years it has been planted extensively in Florida and southern California, where, however, it often suffers from frost.

The avocado is a handsome tree with large, thin, oval or elliptic leaves, copiously pubescent beneath when young. The small, greenish yellow flowers are borne in axillary panicles. The fruit varies greatly in size, shape, color, and quality. An avocado of good quality is one of the best of all tropical fruits, and it is highly esteemed in Central America. The avocado is a very nutritious fruit, full of oil, and is an important article of food in some parts of Central America. Throughout Central America the fruit is known as "aguacate," a term of Aztec origin.

P. caerulea, a native tree, has been noted only on Ancón Hill.

2. **PHOEBE** Nees

Phoebe elongata (Vahl) Nees is a common tree with aromatic leaves.

3. **CINNAMOMUM** L.

Leaves long-acuminate; fruit less than 1 cm. long.
1. **C. camphora** (L.) Nees & Eberm.
Leaves acute or obtuse; fruit 1.5 cm. long----------2. **C. zeylanicum** Nees.

Cinnamomum camphora, the camphor ("alcanfor") tree, native of eastern Asia, is planted occasionally for ornament. It is a small tree here, easily recognized by the camphor odor. The long-petioled leaves are ovate, glabrous, and whitish beneath; the flowers are small and yellowish white. The camphor of commerce is obtained from the wood, the greater part of the product coming from Formosa.

C. zeylanicum, the cinnamon ("canela") tree, of southern Asia, is planted for ornament. It may be recognized by the characteristic odor of the leaves, which are ovate, leathery, and glabrous, and have 3 conspicuous nerves. The small silky flowers are borne in axillary panicles. The cinnamon of commerce consists of the dried bark.

4. **OCOTEA** Aubl.

Flowers perfect; leaves mostly 15 to 30 cm. long----1. **O. dendrodaphne** Mez.
Flowers dioecious; leaves mostly 8 to 15 cm. long.
  Flowers glabrous--------------------------------2. **O. cernua** (Nees) Mez.
  Flowers pubescent------------------------------3. **O. acutangula** (Miq.) Mez.

Other species are known from Panama. *O. dendrodaphne* is an endemic species, first collected at Porto Bello. Specimens from hills near Frijoles probably represent the same species, which is a shrub or small tree. *O. cernua* is occasional. This species is known in Tabasco as "laurel." *O. acutangula* is a tree of rare occurrence. The name "sigua" is given in Panama to the trees of the genus.

5. NECTANDRA Roland

- Leaves rufous-tomentose beneath.............1. **N. laurel** Klotzsch & Karst.
- Leaves glabrous beneath or nearly so.
  - Anthers of the outer series of stamens sessile.
    - Style equaling the ovary.............2. **N. globosa** (Aubl.) Mez.
    - Style much shorter than the ovary.............3. **N. glabrescens** Benth.
  - Anthers of the outer stamens stipitate.
    - Filaments of the outer stamens pilose.
      - Flowers 3 to 5 mm. broad.............4. **N. latifolia** Mez.
      - Flowers 6 to 12 mm. broad.............5. **N. sanguinea** Rottb.
    - Filaments of the outer stamens glabrous.
      - Style conspicuously longer than the ovary....6. **N. rectinervia** Meisn.
      - Style equaling or shorter than the ovary.
        - Flowers 8 mm. broad.............7. **N. panamensis** Mez.
        - Flowers 3 to 4 mm. wide..........8. **N. pichurim** (H. B. K.) Mez.

Other species are found in Panama. *N. laurel* is a small tree of the Atlantic slope. *N. globosa,* common about the zone, is usually a tree of small or medium size, but sometimes flowers when only a shrub of 3 meters. The panicles of white flowers are rather showy. Locally it is called "sigua," and in other parts of Panama "sigua blanco" and "sigua negro." The West Indians call the tree "candlewood," a name given because the wood burns readily. In Salvador the names "canelón" and "aguacate del monte" are used.

N. glabrescens is reported from the zone by Mez. *N. latifolia* was found near Chagres by Fendler. *N. sanguinea* has been collected near the Tapia River. *N. rectinervia,* a common tree on the Pacific slope, is called "sigua." *N. panamensis* is a small tree of the Atlantic watershed. In Nicaragua it is called "aguacate del monte"; in Salvador "tepeaguacate." *N. pichurim* is very common here, a small tree or often only a shrub. In Chiriquí it is known as "sigua canelo."

The best-known tree of the genus is the greenheart, *N. rodiaei* Hook., noted for its durable wood, which is exported from British Guiana. This wood was used in the construction of the gates of the canal locks.

54. BRASSICACEAE. Mustard Family

The name Cruciferae is often used for the family.

1. BRASSICA L. Mustard

- Flowers short-pedicellate, the pedicels shorter than the flowers.
  1. **B. integrifolia** (West) Schulz.
- Flowers long-pedicellate, the pedicels much longer than the flowers.
  2. **B. chinensis** L.

To this genus belong such well-known vegetables as cabbage ("repollo"), cauliflower ("coliflor"), brussels sprouts, collards, kohlrabi, turnips ("nabo"), rutabagas, and mustard ("mostaza"). It is doubtful whether any of these are cultivated successfully about the zone. *B. integrifolia* is a mustard, native of Asia and Africa, collected but once, during construction days. It was probably only a waif, for it has not been observed recently. *B. chinensis,* the Chinese or pakchoi cabbage, is grown in the Chinese gardens and sold in the Panama market. It is known locally as "mostaza," the Spanish generic term for mustards.

I have seen horseradish (*Armoracia rusticana* Gaertn. Mey. & Schreb.) planted in Balboa.

55. CAPPARIDACEAE. Caper Family

Fruit a capsule; plants herbaceous. Leaves palmately compound.
  Filaments united below with the gynophore; flowers rose-purple, showy. **1. GYNANDROPSIS.**
  Filaments free from the gynophore; flowers greenish white or pinkish, inconspicuous------**2. CLEOME.**
Fruit baccate; plants shrubs or trees.
  Leaves composed of 3 leaflets------**3. CRATAEVA.**
  Leaves simple, entire------**4. CAPPARIS.**

The genus *Steriphoma* is represented in Panama. The plants of the family have alternate leaves. The perfect flowers are axillary or in terminal corymbs or racemes, and have 4 to 8 sepals, 4 petals, and few or many stamens. The ovary is sessile or borne upon a long stalk or gynophore; the fruit is many-seeded, dry or fleshy.

1. GYNANDROPSIS DC.

The most common Central American species, *G. speciosa* (H. B. K.) DC., has been collected at Gatuncillo. It is a large annual with long leafy racemes of showy flowers. The name "alelía" is given to it in Salvador and Honduras; in Salvador it is called "alelí," "barba del rey," "volantines," and "flor de mayo."

Another species of *Gynandropsis* grows in Chiriquí.

2. CLEOME L.

Plants armed with spines. Leaflets 5------**1. C. houstoni** R. Br.
Plants unarmed.
  Leaflets 5 to 9------**2. C. pilosa** Benth.
  Leaflets 3------**3. C. serrata** Jacq.

Other species exist in Panama. The fruit in *Cleome*, as in *Gynandropsis*, is a long slender pod. None of the species is common in this region.

3. CRATAEVA L.

The only Central American species, *C. tapia* L., has been collected at Alhajuela. It is a small tree with 3 oblong-elliptic glabrous leaflets and green or purplish flowers in corymbose racemes. The globose or ovoid, green fruit is 2 to 5 cm. in diameter. The tree is said to be known in Panama as "palo de guaco"; in Nicaragua it is called "manzana de playa"; in Venezuela "toco"; in Honduras "cachimbo"; in Salvador "anonillo" and "granadillo macho." The roots are acrid, and the juice upon the skin is reported to cause blisters.

4. CAPPARIS L.

Leaves covered beneath with brownish scales, glabrous on the upper surface.
  Fruit stalked; leaves acute or acuminate------**1. C. isthmensis** Eichl.
  Fruit sessile; leaves obtuse or rounded at apex and apiculate. **2. C. odoratissima** Jacq.
Leaves glabrous beneath or with simple hairs. Fruit long-stalked.
  Leaves rounded or emarginate at apex, rounded at base, glabrous. Fruit smooth------**3. C. flexuosa** L.

Leaves acute or acuminate.
  Fruit smooth; leaves 10 to 30 cm. long; plants glabrous; stamens about as long as the sepals……………………………4. **C. baducca L.**
  Fruit tuberculate; leaves 4 to 8.5 cm. long; plants more or less pubescent; stamens much longer than the sepals……………5. **C. verrucosa Jacq.**

Other species are known from Panama. The plants are shrubs or small trees with white flowers. *C. spinosa* L., of the Mediterranean region, produces the capers ("alcaparras") of commerce, which are the flower buds and sometimes the young fruits preserved with vinegar and salt.

C. isthmensis has been found about the zone only at Alhajuela and near the Tecumen River and *C. odoratissima* is known locally only from Taboga Island. In Mexico it is called "naranjillo." *C. flexuosa* (this has usually been called *C. cynophallophora* L., a name now applied to a different species) is said by Hemsley to have been collected by Seemann near Panama City, but it has not been noted here recently. *C. baducca* is the most common local species. In Colombia it is known as "tinto," "naranjuelo," and "fruta de burro;" in Porto Rica as "palo de burro" and "sapo"; and in Venezuela as "ajito." *C. verrucosa* has been collected at Alhajuela. It is called "naranjillo" in Guatemala, "limoncillo" and "coquito" in Mexico, "ajito" in Venezuela, and "palo de burro" in Porto Rico.

56. MORINGACEAE. Horseradish-tree Family

The family consists of a single genus and species.

1. MORINGA Juss. HORSERADISH-TREE

Moringa oleifera Lam. is planted occasionally. It is a native of Africa and the East Indies, a small tree with alternate, twice or thrice pinnate leaves, and panicles of white sweet-scented flowers having 5 petals and 5 stamens. The fruit is a long slender pendent 3-angled capsule, with winged seeds. The roots have the odor and flavor of horseradish. From the seeds is extracted the ben oil of commerce, employed for lubricating watches and other delicate machines. Since the oil never becomes rancid, it is used as the basis for fine perfumes. In Panama the tree is called "jacinto." Elsewhere in Central America it is known by such names as "paraíso," "árbol de las perlas," "teberinto," and "marango."

57. PODOSTEMONACEAE. Podostemon Family

Flowers with a well-developed perianth; leaves entire, 2 mm. long or less, elliptic or ovate……………………………1. **TRISTICHA.**
Flowers with only a rudimentary perianth; leaves much divided, several cm. long……………………………2. **MARATHRUM.**

The plants are small mosslike herbs, growing submerged in running water and attached to stones. The minute flowers are solitary or clustered at the ends of the stems, on long stiff pedicels. The fruit is a small, 1 to 3-celled capsule.

1. TRISTICHA Thouars

Tristicha hypnoides (St. Hil.) Spreng., the only North American species, is frequent in streams. The plants form dense mats 2 to 3 cm. high over rocky stream beds.

2. **MARATHRUM** Humb. & Bonpl.

Pedicel abruptly enlarged at the apex, forming a broad hypanthium; leaves mostly 10 to 30 cm. long .... **1. M. schiedeanum** Cham.

Pedicel not or scarcely enlarged above; leaves mostly 2.5 to 5 cm. long. **2. M. modestum** (Wedd.) Nash.

Each species has been collected here only once, *M. schiedeanum* in the Juan Díaz River, and *M. modestun* along the Chagres. The name "pesacarne" or "pasacarne" is given to these plants in Panama and Costa Rica. Sometimes they occur in great abundance, and in certain localities they are said to furnish an important forage to cattle during the dry season, when other food is scarce.

58. CRASSULACEAE. Orpine Family

1. **BRYOPHYLLUM** Salisb. LIFEPLANT

Brophyllum pinnatum (Lam.) Kurz, native of the Old World Tropics, is often planted for ornament or as a curiosity in Central America, and in many localities has become thoroughly naturalized. It grows wild in various places in this region. It is an herbaceous glabrous perennial with pinnate, very fleshy leaves, and large panicles of flowers, the calyx inflated and greenish, the corolla brown-red and green. The leaves suggest those of the garden liveforever of the North. When removed from the plant they retain their vitality for a long time, and a tiny plant usually develops at each notch of the leaflet. If a leaf is placed upon moist soil, several new plants are propagated within a short time. Among the West Indians of the zone a favorite method of testing the fidelity of a sweetheart is to place a leaf of this plant above one's door. If a new plant is produced at each notch, her faithfulness can not be questioned. In Salvador the plant is called "hoja del aire" and "sanaltodo."

59. HYDRANGEACEAE. Hydrangea Family

1. **HYDRANGEA** L.

Hydrangea panamensis Standl., an endemic species and the only one known from Panama, was based on material collected along the Río Fató, Province of Colón, and juvenile plants probably representing the same species have been collected near Frijoles. *H. panamensis* is a woody vine with opposite, petioled, chiefly oblong-elliptic, obtuse, entire leaves bearing minute stellate scales. The inflorescences before anthesis are enclosed by large bracts. The very small and inconspicuous flowers are arranged in a dense compound corymb.

Two other species of *Hydrangea* are known from the mountains of Costa Rica. One of them (*H. oerstedii* Briq.) with large, bright pink sterile flowers, is quite as handsome as the cultivated hydrangeas, but the Panama species, which has no enlarged sterile flowers, must be a comparatively unattractive plant.

60. ROSACEAE. Rose Family

Strawberries ("fresas"), blackberries ("moras"), and raspberries ("frambuesas") belong to this family. They are grown to some extent in the mountains of Central America, where there are to be found also many native blackberries (species of *Rubus*).

1. **ROSA** L. ROSE

No roses are native in Central America, although they extend southward into central Mexico. In a swamp near France Field I was surprised to find thriving bushes of *Rosa chinensis* Jacq., the Chinese rose. Probably the seeds had been carried there by birds. This species is frequent in cultivation about the zone, and other common roses are grown successfully.

61. AMYGDALACEAE. Almond Family

Stamens 15 or more. Low seacoast shrub with obovate to rounded, glabrous leaves; flowers in axillary cymes or panicles......**1. CHRYSOBALANUS.**

Stamens 3 to 10.

Petals 5. Shrubs or small trees; stamens long-exserted.....**2. HIRTELLA.**

Petals none or minute. Trees..............................**3. LICANIA.**

The plants have alternate petioled leaves with small stipules, and in our species the leaves are entire. The flowers have a 5-lobed calyx, and the fruit is a drupe. To this family belong the cultivated peaches, plums, cherries, and apricots, all of which are grown to some extent in the mountains of Central America.

1. CHRYSOBALANUS L. Coco-plum

According to Hemsley, *C. icaco* L., the only Central American species, was collected about the mouth of the Chagres by Fendler. The coco-plum is a shrub which bears an edible, white or purple fruit. The usual Central American name is "icaco."

2. HIRTELLA L.

Flowers in simple racemes; stamens 5. Leaves sparsely appressed-pilose; petals rose-purple or pink..............................**1. H. americana L.**

Flowers in thyrsiform panicles; stamens 3.

Leaves sparsely short-pilose beneath; flowers long-pedicellate. Petals pinkish white....................................**2. H. triandra Swartz.**

Leaves densely velvety-pubescent beaneath; flowers sessile or nearly so. **3. H. mollicoma H. B. K.**

No other species are known from Panama. The plants have mostly elliptic-oblong leaves, and rather showy flowers. *H. americana* is a common shrub in woods and thickets. In Salvador it is known as "icaco montés," and in Mexico as "icaquillo." *H. triandra* is known at Chepo as "camaroncillo," It is said to reach a height of 9 meters, but often it is only a shrub.

3. LICANIA Aubl.

Leaves glabrous beneath, narrowly oblong....**1. L. platypus (Hemsl.) Fritsch.**

Leaves white-tomentose beneath.

Ovary glabrous; leaves thick and stiff, broadly rounded at base and apex. **2. L. arborea Seem.**

Ovary tomentose; leaves thin, acuminate..........**3. L. hypoleuca Benth.**

About the zone, *L. platypus* has been noted only in the forests between Panama and the Tecumen River, where it is common. It is one of the handsomest trees of Central America, attaining a great size. The large leaves are usually bronze when first unfolded. The fruit at maturity is very large, sometimes 15 cm. long or more, and it is said that a year is needed for its development. The skin is rough and brownish, the flesh edible but little esteemed, and there is a popular belief that it is unwholesome. In Salvador the fruit is known as "sunzapote," "sunza," and "súngano"; in Costa Rica as "zapote"; and in Mexico as "mesonzapote," "zapote amarillo," "zapote borracho," and "zapote cabello." In Panama the tree is called "sangre."

L. arborea (pl. 29) is a tree of small or medium size, confined locally to the Pacific watershed. The hard stiff leaves are very characteristic. The large seeds are rich in oil, and in some regions they are strung on sticks and burned like candles for illuminating purposes. In Salvador the tree is known as "canilla de mula," "jobo," and "roble," and in Panama as "raspa." *L. hypoleuca* is known locally only from Barro Colorado Island.

62. CONNARACEAE. Connarus Family

Calyx lobes valvate; capsule densely tomentose at maturity; leaflets densely pubescent beaneath. Capsule sessile................1. **CNESTIDIUM.**
Calyx lobes imbricate; capsule glabrous or glabrate at maturity; leaflets glabrous or glabrate beneath.
  Capsule sessile; calyx enlarged after flowering................2. **ROUREA.**
  Capsule stalked; calyx not enlarged......................3. **CONNARUS.**

No other genera are represented in North America. The plants are shrubs, small trees, or woody vines with alternate odd-pinnate leaves and entire leaflets. The small, inconspicuous, racemose or panicled flowers have 5 petals and 10 or fewer stamens. The fruit is a leathery or woody, 1-seeded follicle, the seed subtended by an aril.

1. CNESTIDIUM Planch.

Cnestidium rufescens Planch., the only species, is frequent in thickets and forests.

2. ROUREA Aubl.

Rourea glabra H. B. K. is a common woody vine with white flowers, red fruit, and shining, dark brown seeds. The plant is known in Salvador as "canjuro"; in Mexico as "chilillo"; in Cuba as "mata-negro"; and in Porto Rico as "bejuco de garrote" and "Juan caliente." The tough stems are used in some regions as cordage. The seeds are reputed very poisonous, being employed in Central America for destroying noxious animals, and it is reported that they have been used for criminal poisoning of human beings. In Salvador the birds known as *chachas* are fond of the seeds, and it is claimed that flesh of birds feeding upon the seeds is poisonous to persons who eat it.

2. CONNARUS L.

Panicles densely brown-tomentose; leaflets 3.......1. **C. panamensis** Griseb.
Panicles appressed-puberulent; leaflets usually 5.
  2. **C. turczinanowii** Triana & Planch.

Both species are known only from Panama.

63. MIMOSACEAE. Mimosa Family

Leaves once pinnate; pods indehiscent, broad. Unarmed trees.....1. **INGA.**
Leaves twice pinnate; in one species of *Pithecolobium* once pinnate, but the fruit narrow, twisted, and dehiscent.
  Anthers tipped with a small gland. Flowers in spikes.
    Plants large woody unarmed vines; fruit breaking up into 1-seeded joints. 2. **ENTADA.**
    Plants erect spiny shrubs or trees; fruit not jointed......3. **PROSOPIS.**
  Anthers without glands.
    Stamens as many as the corolla lobes or twice as many.
      Plants unarmed; valves of the pod not separating from their margins.
        Pods about 2 cm. wide, the seeds transversely placed; trees. 4. **LEUCAENA.**

Pods 3 mm. wide, the seeds longitudinally placed; herbs or low shrubs. **5. DESMANTHUS.**

Plants armed with prickles; valves of the mature pod separating from their margins. Flowers in heads.

Pods flat, much wider than thick---------------------**6. MIMOSA.**

Pods 4-sided, about as thick as broad----------**7. LEPTOGLOTTIS.**

Stamens numerous.

Filaments free. Plants usually armed with spines or prickles; flowers in heads or spikes-------------------------------------**8. ACACIA.**

Filaments united below.

Valves of the fruit separating from the persistent margins. Unarmed tree; flowers in umbels; valves of the fruit thin, straight. **9. LYSILOMA.**

Valves of the fruit not separating from the margins.

Valves of the fruit very thin, broad, straight; introduced tree, unarmed. Flowers in heads-----------------**10. ALBIZZIA.**

Valves of the fruit usually thick, often curved, coiled, or twisted.

Fruit coiled, broad, flat, indehiscent; unarmed tree; flowers in heads---------------------------**11. ENTEROLOBIUM.**

Fruit various but usually not coiled, commonly narrow and dehiscent; plants armed or unarmed; flowers in heads or spikes. **12. PITHECOLOBIUM.**

Other genera are represented in Panama. The family is often united with the Fabaceae and Caesalpiniaceae to form a single family, Leguminosae. The flowers are mostly small, with free or usually connate petals and few or numerous stamens. In many plants of the family the leaves are "sensitive," that is, they respond when touched by folding their leaflets together. They often react in the same way upon the approach of darkness or during excessively dry weather.

1. INGA Scop.

Rachis of the leaf winged between the leaflets, at least between the upper pair.

Flowers in globose heads, on long slender pedicels. Leaves 2 pairs, glabrous. 1. I. **gracilipes** Standl.

Flowers in short or elongate spikes, sessile.

Leaflets glabrous; corolla about 3 mm. long; fruit about 2 cm. wide, glabrous, the margins little thickened----------**2. I. marginata** Willd.

Leaflets copiously pubescent; corolla 7 to 20 mm. long; fruit often much more than 2 cm. wide, the edges much thickened, or sometimes subterete and sulcate.

Rachis winged only between the upper 2 pairs of leaflets. Leaflets 3 pairs; fruit glabrous or nearly so---------**3. I. panamensis** Seem.

Rachis winged between all the pairs of leaflets.

Leaflets 5 or more pairs in most of the leaves, lance-oblong; calyx about 15 mm. long. Fruit densely tomentose. **4. I. spuria** Humb. & Bonpl.

Leaflets 3 or 4 pairs, usually broader; calyx less than 12 mm. long.

Calyx glabrous or nearly so, about 1 cm. long. Fruit densely hirsute, compressed----------------------------**5. I. hayesii** Benth.

Calyx densely pubescent.

Pods flat, densely hirsute---------------**6. I. goldmanii** Pittier.

Pods not flattened, thick.

Calyx 10 mm. long, with spreading pubescence. **7. I. pauciflora** Walp. & Duch

Calyx 5 mm. long, with appressed pubescence. Fruit subterete, densely tomentose---------------------**8. I. edulis** Mart.

- Rachis of the leaf not winged.
  - Flowers pedicellate, in heads........................**9. I. roussoviana** Pittier.
  - Flowers sessile, in short or elongate spikes.
    - Leaflets (2 pairs) very large, 10 to 20 cm. wide, coriaceous, rounded or obtuse at apex, glabrate. Fruit glabrous, 4.5 to 7 cm. wide, very thick. **10. I. spectabilis** Willd.
    - Leaflets small, mostly less than 7 cm. wide, usually acute or acuminate.
      - Flowers about 3 mm. long, in slender elongate spikes; leaflets 2 or 3 pairs, glabrous, obovate, cuneate at bsae. Fruit thin, glabrous, about 2.5 cm. wide..........................**11. I. laurina** (Swartz) Willd.
      - Flowers 5 mm. long or larger, in short dense spikes; leaflets oblong to ovate or elliptic, mostly obtuse or rounded at base, more or less pubescent beneath.
        - Calyx about 10 mm. long. Leaflets numerous, about 9 pairs. **12. I. multijuga** Benth.
        - Calyx about 5 mm. long or shorter.
          - Leaflets 4 or 5 pairs. Fruit flat, about 2.5 cm. wide, puberulent. **13. I. ruiziana** Don.
          - Leaflets 2 or 3 pairs.
            - Leaflets 2 pairs; fruit flat................**14. I. punctata** Willd.
            - Leaflets 3 pairs; fruit much thickened..**15. I. leptoloba** Schlecht.

Other species grow in Panama. The plants are usually medium-sized trees, and have simply pinnate leaves. The flowers are white or greenish, with long hairlike stamens. There is great variation in the fruit, but it is always indehiscent. The seeds are imbedded in a pulp that is very abundant and whitish in some species and juicy and sweet. The pods are often seen in Central American markets, many people, especially children, being very fond of the pulp. The American children in the zone also like it, and call the pods "ice-cream beans." In Panama there is a popular riddle or *refrán* which says: "Ataud verde, sábana blanca y muerto negro: ¿Qué será? Vainas de guava." (A green coffin, white shroud, and black corpse: What is it? Guava pods.)

In Central America *Inga* trees are considered the best coffee shade. A coffee finca with shade wholly of such trees, all of about the same size, is a handsome sight.

I. gracilipes is an endemic species, known only from swamps near France Field. Its vernacular name is "guava," the term applied here to all the species. This should not lead to confusion with the plant (*Psidium guajava*) which bears the English name guava, but is called in Spanish "guayaba."

I. marginata grows about Gatún Lake. In the Changuinola Valley it is said to be called "sweetwood," and the Costa Rican name is "sota-caballo." *I. panamensis* occurs on the Atlantic slope, and is endemic in Panama. It is called "guavo."

I. spuria (pl. 30) is frequent about the zone, being known as "guavo" (this is the name of the tree; the fruit is "guava"). In Salvador it is called "nacaspilo," "pepete," "pepetillo," and "cuijín"; in Costa Rica "cuajiniquil"; in Guatemala "guamo." The fruit of this species is edible.

I. hayesii is another endemic species, apparently confined to the Pacific slope. The vernacular names are "guavo" and "guamo." *I. goldmanii*, a large tree, is known as "guavo de mono." *I. pauciflora* is endemic in Panama. *I. edulis*, which grows upon the Atlantic slope, is called here "guavo" and in Costa Rica "guayaniquil." *I. roussoviana* has been collected near France Field.

I. spectabilis, easily recognized by its broad stiff leaflets, is a large handsome tree. Locally it is called "guava," "guava de Castilla," and "guava real," and by the West Indians "monkey tambrin." The enormous pods are sold in the market of Panama City. *I. laurina* has been collected along the Río Tapia. In Salvador it is called "chapernillo," "paternillo," and "cuajinicuil." *I. multijuga* is confined to the Atlantic slope, likewise *I. ruiziana* and *I. leptoloba* (pl. 31). The last is said to be called "guavita cansa-boca." In Salvador it is known as "pepeto," and in Mexico as "cuajinicuil." *I. marginata* is a common tree about the zone. At Chepo it is called "guavo de mono," and in Salvador "pepeto."

2. ENTADA Adans.

Pods curved, over 10 cm. wide, constricted between the seeds; seeds 5 to 6 cm. broad .... 1. **E. scandens** (L.) Benth.
Pods straight, usually less than 8 cm. wide, not constricted between the seeds; seeds about 2 cm. broad .... 2. **E. polystachia** (L.) DC.

The plants are coarse woody vines with large oblong leaflets and dense spikes of small greenish flowers, the spikes arranged in racemes. The valves of the pod break up in to 1-seeded joints.

E. scandens is occasional in the forest of the Atlantic slope, a huge vine climbing to the tops of high trees, its stems compressed and twisted. The dark brown seeds are among the "sea beans" often found on tropical shores. The Panama name is "javilla," a term used also in Costa Rica. *E. polystachia* is a common vine, usually not nearly so large as *E. scandens*. In Salvador it is called "quiamol" and "cola de zorrillo"; in Costa Rica "parra rosa"; in Nicaragua "bejuco de hierro"; in Mexico "bejuco de amole," "bejuco de panune," "bejuco de estribo," and "bejuco de mondongo."

3. PROSOPIS L. MESQUITE

Prosopis chilensis (Mol.) Stuntz (*P. juliflora* DC.), the only Central American species, common in the thickets along the Pacific beaches, is a spiny shrub or small tree. The leaves have two pairs of pinnae and numerous oblong leaflets 7 to 15 mm. long. The greenish flowers are in dense spikes 5 to 10 cm. long. The pod is linear, thick, 10 to 20 cm. long, about 1 cm. wide, the seeds imbedded in a sweet pulp. The mesquite is a common tree along the Pacific coast of Central America, and is abundant in Mexico and the southwestern United States, as well as in parts of the West Indies. The hard close-grained wood is valuable for many purposes. The pods contain much sugar and are eaten by stock. The pulp is eaten commonly by children, and the ground pods formed an important article of food among the Indians of the southwestern United States. The meal was baked in cakes or mixed with water to form a kind of gruel. In Hawaii the mesquite has been naturalized, and a substantial industry has developed in the grinding of the pods into meal, which is used as feed for stock.

In Panama mesquite is called "aromo," a name widely employed in western Central America. The name "manca-caballo" also is reported from Panama. In Salvador the name "carbón" is used; in Mexico "mezquite" (of Aztec origin) and "algarrobo."

4. LEUCAENA Benth. LEADTREE

Leucaena glauca (L.) Benth. is planted in Balboa, and is growing also at Darién, but is probably not native here, although it is widely distributed in tropical America. It is a shrub or small tree, the leaves with very numerous glabrous oblong leaflets about 12 mm. long, the greenish white flowers in dense globose heads. The pods are flat, stalked, glabrous, and nearly 2 cm. wide. In Cuba the tree is called "aroma blanca," in Porto Rico "hediondilla." There is a popular belief in tropical America that if horses, mules, or pigs eat any part of the plant their hair will fall out.

L. macrophylla Benth. is reported from Empire by Hemsley, but probably in error, for the species has not been found here recently, and is known otherwise only from Mexico.

5. DESMANTHUS Willd.

Desmanthus depressus Humb. & Bonpl. (*Acuan depressum* Kuntze) is frequent on the Pacific slope. It is an herb or shrub, the leaves with numerous small leaflets, the small whitish flowers in globose heads, the pods linear, 2 to 6 cm. long, 3 mm. wide, compressed.

The oldest name for the genus is *Acuan* Medik., which is not Latin in form, and should therefore be rejected.

6. MIMOSA L. SENSITIVE-PLANT

Leaflets few, 2 to 5 pairs, large, 6 to 12 mm. wide or larger. Stamens as many as the corolla lobes; stems and petioles with recurved prickles.
  Pinnae with 4 or 5 pairs of leaflets. Leaflets acute; fruit glabrous, the margins prickly .... **1. M. casta** L.
  Pinnae with 2 pairs of leaflets.
    Fruit glabrous, the margins prickly; stems glabrous; leaflets acute. **2. M. velloziana** Mart.
    Fruit hispid; stems pilose; leaflets mostly obtuse. Flowers pink. **3. M. panamensis** (Benth.) Standl.
Leaflets numerous, usually 10 or more pairs, small, less than 3 mm. wide. Flowers pink.
  Stems angled, armed on the angles with very numerous, strongly recurved prickles. Pods densely hispid, 1.5 cm. long or less; stamens twice as many as the corolla lobes .... **4. M. invisa** Mart.
  Stems not angled, the prickles mostly straight.
    Pinnae 2 pairs; stamens as many as the corolla lobes; plants herbaceous; pods 2 cm. long or less, glabrous or sparsely hispid .... **5. M. pudica** L.
    Pinnae 4 or more pairs; stamens twice as many as the corolla lobes; plants woody or suffrutescent; pods mostly over 4 cm. long.
      Corolla striate; pods about 4 mm. wide; stems glandular-pilose. **6. M. somnians** Humb. & Bonpl.
      Corolla not striate; pods 1 cm. wide or broader; stems hispid. **7. M. pigra** L.

Other species are known from Panama. All ours have flowers in dense globose heads.

M. casta has been found here only once, between Miraflores and Corozal, and *M. velloziana* was collected near Chagres by Fendler. *M. panamensis* is common on the Pacific slope. Its vernacular names are "dormidera," "dormidera de escobilla," and "ciérrate de escobilla." *M. invisa* (*Morongia pilosa* Standl.) also is abundant on the Pacific watershed.

M. pudica, a very common weed, is one of the species to which the term "sensitive-plant" is most often applied. This is given because of the fact that if the leaves are touched the leaflets immediately fold together; but after a short time they resume their normal position. The same form of movement takes place in many other Leguminosae. *M. pudica* is known here as "dormidera," "ciérrate," and "cierra tus puertas" ("shut your doors"), and the West Indians call it "shameweed" and "shame-face." In Salvador it is called "zarza," "zarza dormilona," "zarzaviva," and "sinvergüenza;" in Mexico "sensitiva," "dormilona," and "ten-vergüenza."

M. somnians, common on the Pacific slope, is called "dormidera." *M. pigra* (*M. asperata* L.), frequent in the same region, especially in open swamps, is a large erect shrub. In Salvador and Costa Rica it is called "zarza;" in Salvador "dormilona;" in Guatemala "sinvergüenza."

7. LEPTOGLOTTIS Nutt.

Pinnae 1 or 2 pairs; flowers pink..............**1. L. leptocarpa** (DC.) Standl.
Pinnae 4 or 5 pairs; flowers white.......**2. L. hamata** (Humb. & Bonpl.) Standl.

The names *Schrankia* and *Morongia* have usually been applied to the genus, but *Leptoglottis* is the oldest generic name for the group. The plants have angled stems armed with numerous small recurved spines, flowers in globose heads, small leaflets, and slender, very prickly pods. *L. leptocarpa*, a small procumbent herb, is occasional on the Pacific slope, and *M. hamata*, common in the same area, is a large herb clambering over bushes. It is called "zarza," a name signifying merely "bramble."

8. ACACIA Willd. Acacia

Spines large, inflated, hollow, the pairs resembling the horns of an ox.
  Petiole bearing very numerous glands, these scattered irregularly or in several rows; pinnae usually about 30 pairs. Flowers in globose heads. **1. A. melanoceras** Beurl.
  Petiole bearing few (usually about 3) glands in a single row; pinnae about 8.
    Flowers in elongate spikes. Fruit turgid, splitting at maturity along both edges................................**2. A. costaricensis** Schenck.
    Flowers in globose heads...................**3. A. panamensis** Schenck.
Spines slender, not hollow, often very small or absent.
  Flowers in spikes..................................**4. A. hayesii** Benth.
  Flowers in globose heads.
    Branches with pairs of long straight spines; fruit subterete, about 1 cm. in diameter...........................**5. A. farnesiana** (L.) Willd.
    Branches with very short, recurved spines, or unarmed; fruit flat, 2.5 to 3 cm. wide.
      Costa of the leaflets close to the margin; pods glabrous. **6. A. glomerosa** Benth.
      Costa remote from the margin; pods velvety-pubescent. **7. A. riparia** H. B. K.

Other species are found in Panama. All those enumerated above have numerous small oblong leaflets, 3 mm. wide or smaller, and white or yellow flowers.

The first three species listed belong to the section known as bullhorn acacias, one of the most interesting groups of Central American plants. The large spines are punctured early by ants (*Pseudomyrma*), which make their home inside, a complete colony in each spine. The young leaves bear yellow nectar bodies upon which the ants feed. If the plant is disturbed, the ants sally forth and attack the intruder. They are very alert and fierce, and inflict painful bites (especially *P. satan* on *Acacia melanoceras*).

A. melanoceras (of which *A. multiglandulosa* Schenck is a synonym; pl. 32) is a common shrub in the swamps and forests of the Atlantic slope. The vernacular name is "cachito." *A. costaricensis* (*A. penonomensis* Safford), common on the Pacific watershed, usually in rather dry thickets, is called "cuernito" and "cachito." *A. panamensis* is a little-known species, described from Alhajuela. Species of this group of *Acacia* are widely distributed in tropical America.

A. hayesii was collected at Mamei many years ago and is known from a single collection, although a plant known in Panama as "uña de gato," but represented only by sterile specimens, may belong to the species. *A. glomerosa* also is rare.

In Salvador it is called "cagalero," "zarza," "malacaro," and "llora-sangre." *A. riparia* has been found on Taboga Island. It is known in Salvador as "zarza," and in Mexico as "gatuño blanco."

A. farnesiana, a widely distributed species, common here near the Pacific coast, is a shrub or small tree with very fragrant, bright yellow flowers. A gum which exudes from the trunk is similar to gum-arabic, which is produced by an Old World species of *Acacia*. In France the shrub is cultivated on a large scale for the blossoms, known in commerce as cassie flowers, from which perfume is made. The pods yield a black dye and have been utilized for making ink. In Panama this species is called "aromo," a name widely employed. Other names are "espino blanco" and "espino ruco" (Salvador), and "huisache" (Mexico). In the southern United States the name "opoponax" is used for the sweet acacia.

9. **LYSILOMA** Benth.

Lysiloma guachapele (H. B. K.) Benth. (a synonym is *Pithecolobium longipedatum* Pittier) is a large tree with bipinnate leaves having numerous large, oval or rounded-obovate, pubescent leaflets, rounded at apex. The flowers are in dense umbels, the fruit flat and thin, about 3 cm. wide, and densely pubescent. The tree is occasional near the Pacific coast, and is sometimes planted for shade. In Salvador, where it is called "carreto," cross sections of the trunk are used for cartwheels.

10. **ALBIZZIA** Durazz.

The lebbek, *Albizzia lebbeck* (L.) Benth., native of the Old World tropics, is planted in Colón. It is an unarmed tree with large leaves having numerous obliquely oblong leaflets, rounded at apex, and heads of creamy white, pediceled flowers. The pod is oblong, glabrous, about 4 cm. wide, with thin valves. At Colón the tree is said to be called "mata-ratón." The English names are "woman's-tongue" and "Tibet tree." In Salvador it is called "acacia."

11. **ENTEROLOBIUM** Mart. EAR-TREE

The ear-tree, *E. cyclocarpum* (Jacq.) Griseb., a common tree of the Pacific slope, has a wide distribution in tropical America. It is one of the largest and finest trees of the continent, with a trunk often 2 to 3 meters thick, and a very broad, spreading crown of graceful foliage. The leaves have numerous small (10 to 12 mm. long) leaflets, and the white flowers, with long stamens, form globose heads. The tree is easily recognized by its fruit, quite unlike that of any other plant of the region. The pod is broad and flat, and coiled in such a way as to suggest the human ear. The brown wood is not very heavy but is rather durable and takes a good polish. It is much used in tropical America for a great variety of purposes and some is exported to the United States to be employed for interior finish. Near the zone cattle often may be seen under the trees eating the pods or flowers.

In Panama the tree is called "corotú" or "curutú," but generally in Central America it is known as "guanacaste," an Aztec name meaning "ear tree." The Province of Guanacaste in Costa Rica derives its name from this tree. The variant name "conacaste" also is used in some localities, and other names are "árbol de orejas" (Salvador, Cuba), "parota" (Mexico), "piche" (Tabasco), "huinacaxtle" (Mexico), and "carito" (Colombia).

Another species, *E. schomburgkii* Benth., with smaller leaflets, grows in Chiriquí, where it is called "jarina."

12. PITHECOLOBIUM Mart.

Leaves once pinnate. Plants unarmed; leaflets usually 3 or 4 pairs, elliptic, mostly 2.5 to 5 cm. wide; flowers in dense globose heads; fruit slender, elongate, twisted, bright red..............1. **P. rufescens** (Benth.) Pittier.

Leaves twice pinnate.

Leaflets about 2 mm. wide. Spiny tree; flowers in heads; fruit compressed, about 1 cm. wide..................2. **P. parvifolium** (Willd.) Benth.

Leaflets 1 cm. wide or larger.

Leaves with several pairs of pinnae in most of the leaves. Flowers in heads.

Leaflets acute or acuminate, pale beneath, the pubescence of very minute, appressed hairs. Flowers sessile; fruit thin, glabrous, 2.5 cm. wide. 3. **P. adinocephalum** Donn. Smith.

Leaflets rounded or very obtuse at apex, not pale beneath.

Gland between the lowest pinnae minute; pubescence of the lower surface of leaflets mostly of spreading hairs. 4. **P. saman** (Jacq.) Benth.

Gland between the lowest pinnae 3 to 10 mm. long; pubescence of leaflets of minute appressed hairs....5. **P. macradenium** Pittier.

Leaves all with a single pair of pinnae.

Pinnae each with 3 or more leaflets; flowers lateral on naked branches; plants unarmed. Fruit 1.5 to 2 cm. wide, straight or nearly so, not constricted between the seeds.

Each pinna with 3 leaflets........6. **P. vahlianum** (DC.) Benth.

Each pinna with 5 or more leaflets.....7. **P. latifolium** (L.) Benth.

Pinnae each with 2 leaflets; flowers on leafy branchlets, mostly in terminal panicles; plants armed with spines; fruit usually less than 1.5 cm. wide, coiled or twisted, constricted between the seeds.

Flowers in globose heads..............8. **P. dulce** (Roxb.) Benth.

Flowers in short or elongate spikes.

Stamen tube scarcely exserted from the corolla; leaflets mostly 2.5 to 5 cm. long......................9. **P. oblongum** Benth.

Stamen tube long-exserted; leaflets mostly 9 to 15 cm. long. 10. **P. hymenaeaefolium** (Humb. & Bonpl.) Benth.

Numerous other species are found in Central America, some of them extending to Panama. The flowers are usually creamy or greenish white.

P. rufescens is a very common shrub or small tree, easily recognized by the once pinnate leaves and showy red fruit with black seeds. The vernacular names are "coralillo," "flor de indio," "harino," and "jarino." *P. parvifolium* is a small tree, frequent in thickets and pastures of the Pacific slope.

P. adinocephalum (*P. discolor* Pittier) is a common tree of medium or large size, frequently planted for shade. In Costa Rica it is called "gavilancillo"; in Salvador "conacaste blanco," "chaculaltapa," and "chapilte."

P. saman (*Samanea saman* Merrill), the raintree, occasional near the Pacific coast and also planted for shade, is a common tree of the Pacific slope of Central America, frequently attaining a large size. It is known as "cenícero" in Salvador and Guatemala; as "carreto" in Salvador; as "samán" in Porto Rico and Venezuela; and as "campaño" in Colombia. The wood is useful for many purposes, and cross sections of the trunk are often used for cart wheels. The pods contain a sweet pulp and are eaten by cattle. The leaflets are said to fold together during cloudy weather, hence the name raintree.

In general appearance *P. macradenium* is similar to *P. saman*. It is an endemic species, known only from Monte Lirio.

P. vahlianum is a very common, small, slender tree, almost confined to stream banks. Its local names are "sota-caballo" (used also in Costa Rica) and "azota-caballo." In the Changuinola Valley it is called "sweetwood" and "river-wood." *P. latifolium* (*P. chagrense* Pittier), similar in habit and with pink flowers, seems to be confined here to the swamps of the Atlantic slope. *P. dulce* is planted in Balboa but has not been found wild. It is one of the characteristic trees of the Pacific slope of Central America and Mexico. The seeds are surrounded by an acidulous aril that is eaten, and is used to prepare a *fresco* similar to lemonade. The tree is known in Mexico as "guamúchil" or "guamuche"; in Nicaragua as "espino de playa"; in Costa Rica as "mochigüiste; in Salvador as "guachimole," "mongollano," and "guayacán blanco." *P. oblongum* is a native tree, similar in appearance, common along the Pacific slope, usually on the seashore. *P. hymenaeaefolium* is occasional on the Pacific slope.

64. CAESALPINIACEAE. Senna Family

- Leaves bipinnate. Trees or shrubs.
  - Pods narrowly winged. Cultivated tree with yellow flowers. **1. PELTOPHORUM.**
  - Pods not winged.
    - Calyx lobes imbricate; valves of the pod thin. Trees or shrubs with yellow or red flowers .... **2. CAESALPINIA.**
    - Calyx lobes valvate; valves of the pod woody. Cultivated tree with red flowers .... **3. DELONIX.**
- Leaves once pinnate, bifoliolate, or simple.
  - Anthers erect.
    - Petals 5; stamens 5 to 10. Herbs, shrubs, or trees; leaflets 2 to many pairs .... **4. CASSIA.**
    - Petals 1 or 2 or none; stamens 2. Trees .... **5. DIALIUM.**
  - Anthers versatile. Trees or shrubs.
    - Leaves simple or with 2 leaflets.
      - Pods dehiscent.
        - Calyx 5-lobed; leaves simple or of 2 leaflets .... **6. BAUHINIA.**
        - Calyx of 4 sepals; leaflets 2 .... **7. PELTOGYNE.**
      - Pods indehiscent. Leaves with 2 leaflets.
        - Ovules 2; pods rugose or verrucose .... **8. CYNOMETRA.**
        - Ovules 3 or more; pods smooth .... **9. HYMENAEA.**
    - Leaves with 4 or more leaflets.
      - Flowers in headlike clusters, red or pink. Leaflets several pairs. **10. BROWNEA.**
      - Flowers in racemes or spikes.
        - Leaflets 4.
          - Petals none .... **11. PRIORIA.**
          - Petals 5 .... **12. DIMORPHANDRA.**
        - Leaflets more than 4.
          - Fruit subglobose; leaflets gland-dotted .... **13. COPAIVA.**
          - Fruit elongate; leaflets not gland-dotted .... **14. TAMARINDUS.**

Other genera are represented in Panama. The plants of this family are usually unarmed. The flowers are often large and showy, regular or irregular, with usually 5 petals and 10 stamens. The fruit is a legume, but very diverse as to form.

1. PELTOPHORUM Vog.

Peltophorum inerme (Roxb.) Naves, native of the East Indies, is planted for shade about Balboa. It is a handsome large deciduous tree with bipinnate leaves composed of numerous oblong leaflets 1 to 2 cm. long. The showy yellow flowers are borne in axillary or terminal panicles. The pods are flat, indehiscent, 5 to 8 cm. long, 1 to 4-seeded, narrowly winged on the margins, the valves conspicuously nerved.

2. CAESALPINIA L.

Pods oval, very spiny.......................................**1. C. crista** L.
Pods oblong-linear, unarmed.
  Racemes stellate-tomentose; leaflets pubescent.....**2. C. eriostachys** Benth.
  Racemes and leaflets glabrous..............**3. C. pulcherrima** (L.) Swartz.

The plants are shrubs or trees, often prickly, with bipinnate leaves. *C. crista* occurs on seashores, often forming dense thickets. Its flowers are small and inconspicuous, the marble-like seeds gray, and about 2 cm. broad. The seeds are sometimes called "nickernuts," and are one of the "sea beans" of tropical shores. They are very hard, and have been carried by ocean currents to the shores of Europe. The Panama names are "mato" and "calentura."

C. eriostachys is a small tree, common along the Pacific coast of Central America. There is a single individual growing beside the bridge over the Río Abajo, on the road to the Tapia River, but the species has not been found elsewhere about the zone, and is probably not native. It was described by Pittier as *Schizolobium covilleanum.* This species is known in Salvador as "pintadillo" and "iguano."

C. pulcherrima is cultivated for ornament. It is very common in cultivation in Central America, and is naturalized in many places, but is perhaps not native. It is a shrub or tree, often prickly, bearing racemes of large, red or yellow flowers with long-exserted stamens. The English names are "Barbados-pride," "flower-fence," and "bird-of-paradise flower." In Panama the plant is called "gallito"; in Salvador "flor barbona," "guacamaya," and "barbón"; in Colombia and Costa Rica "clavellina"; in Mexico "tabachín" and "flor de camarón"; and there are many other names listed.

3. DELONIX Raf.

The royal poinciana or flametree, *D. regia* (Bojer) Raf. (*Poinciana regia* Bojer), native of Madagascar, is planted as an ornamental tree here, as almost everywhere in tropical America. It is a tree with few spreading branches, not at all attractive except when in flower, in spring, when it becomes a mass of flame-colored blossoms. The pods are pendent, 40 to 60 cm. long, very hard and heavy. In Central America the tree is usually called "árbol de fuego" or "flor de fuego." In Salvador it is called also "guacamaya," and in some other regions "flamboyán" or "framboyán," modifications of the French "flamboyant."

4. CASSIA L.

Fruit 2-valved, elastically dehiscent. Plants herbaceous.
  Leaflets 1 to 3 pairs.
    Plants viscid-pilose, procumbent; petioles longer than the leaflets; petals salmon red. Leaflets 2 pairs.....................**1. C. killipii** Rose.
    Plants without viscid pubescence; petioles much shorter than the leaflets; petals yellow.
      Leaflets 1 pair.......................................**2. C. diphylla** L.

Leaflets 2 or 3 pairs.

Leaflets 2 pairs, mostly 15 to 20 mm. long; plants erect; pedicels 3 mm. long or less.......... 3. **C. brevipes** DC.

Leaflets usually 3 pairs, less than 10 mm. long; plants procumbent; pedicels 10 to 15 mm. long.......... 4. **C. tagera** L.

Leaflets numerous, usually 12 to 30, often more numerous. Petals yellow.

Gland of the petiole conspicuously stalked.......... 5. **C. stenocarpa** Vog.

Gland of the petiole sessile.

Leaflets glabrous, ciliate.......... 6. **C. simplex** Standl.

Leaflets densely pubescent.......... 7. **C. patellaria** DC.

Fruit indehiscent, or dehiscent but not elastically dehiscent.

Leaflets 2 pairs; plants woody, not hirsute. Pods terete or nearly so; flowers very large and showy.

Leaflets tomentulose beneath.......... 8. **C. oxyphylla** Kunth.

Leaflets glabrous or nearly so.

Bracts of the inflorescence large, green, persistent; leaflets lustrous above, not very oblique at base, green beneath; flowers greenish yellow. 9. **C. undulata** Benth.

Bracts small, inconspicuous, early deciduous; leaflets dull, very oblique at base, pale beneath; flowers pale buff.......... 10. **C. bacillaris** L.

Leaflets 3 or more pairs; in one species 2 pairs, but the stems herbaceous and hirsute.

Pods indehiscent, terete, woody. Trees.

Leaflets 4 to 8 pairs, oblong-ovate, glabrate, usually 7 cm. wide or larger. Anthers glabrous; petals yellow.......... 11. **C. fistula** L.

Leaflets usually more than 10 pairs, oblong, pubescent beneath, 1.5 cm. wide or narrower.

Anthers and ovary glabrous. Petals bright yellow. 12. **C. moschata** H. B. K.

Anthers and ovary pubescent.

Leaflets usually rounded at apex; sepals densely white-tomentose. Petals pink.......... 13. **C. grandis** L. f.

Leaflets acutish; sepals obscurely tomentulose. Petals reported as "yellow with purple veins.".......... 14. **C. regia** Standl.

Pods usually dehiscent and compressed, in some species terete but with very thin valves.

Petiolar gland borne at the base of the petiole. Herbs with acuminate leaflets.

Plants glabrous.......... 15. **C. occidentalis** L.

Plants pilose.......... 16. **C. confusa** Rose.

Petiolar glands borne between the leaflets or wanting.

Petiolar glands present. Leaflets obtuse or rounded at apex.

Leaflets 2 pairs; stems hirsute.......... 17. **C. pilifera** Vog.

Leaflets 3 or more pairs; stems not hirsute.

Fruit terete, usually 12 to 15 mm. in diameter. Leaflets 4 or 5 pairs.......... 18. **C. bicapsularis** L.

Fruit compressed, 6 mm. wide or narrower.

Leaflets about 8 pairs, pale beneath; stems woody. 19. **C. pallidior** Rose.

Leaflets 3 pairs, green beneath; stems chiefly herbaceous.

Pods 4 mm. wide.......... 20. **C. leiophylla** Vog.

Pods 2.5 mm. wide.......... 21. **C. tora** L.

Petiolar glands absent. Shrubs or trees.
  Fruit longitudinally winged. Shrub with large oblong leaflets. **22. C. alata L.**
  Fruits not winged.
    Plants glabrous; stipules large, broad, foliaceous; valves of the pod each with a longitudinal ridge..**23. C. nicaraguensis** Benth.
    Plants pubescent, at least about the inflorescence; stipules small, narrow, bractlike; valves of the fruit smooth.
      Leaflets 9 to 12 pairs, thin, densely pubescent; valves of the fruit thin; native shrub or tree......**24. C. reticulata** Willd.
      Leaflets 6 to 10 pairs, thick, glabrous or nearly so; valves of the fruit woody; introduced species......**25. C. siamea** Lam.

Other species occur in Panama. *C. killipii* is an endemic plant, occasional in grassland on the Pacific slope. *C. brevipes* has been collected at El Vigía and on Taboga Island. *C. brevipes*, reported by Hemsley as collected near Panama by Seemann, has not been found recently. *C. tagera* is frequent in grassland on the Pacific slope.

C. stenocarpa, *C. simplex*, and *C. patellaria* are all common, at least on the Pacific slope. They, with nos. 2, 3, and 4, are often separated as the genus *Chamaecrista*, some species of which are known in the United States as partridge-pea. The leaflets in this group respond to irritation by closing, as in plants of the family Mimosaceae. For *C. stenocarpa* I was given the name "palmilla."

C. oxyphylla, *C. undulata*, and *C. bacillaris*, all much alike in general appearance and common here, have handsome flowers. They are large slender shrubs which often recline upon larger plants. *C. oxyphylla* is called "frijol de monte," and in Darién "ictericia" (jaundice), doubtless in reference to the color of the flowers.

C. fistula, planted as a shade tree about the zone, is a native of Asia and a very showy tree when in flower. The long pendent pods contain a bitter pulp which has laxative properties. The current name is "cañafístula." *C. moschata* is occasional in the region, a tree of 10 meters or more with widely spreading branches. It also is called "cañafístula," and by the West Indians "stinking-toe." *C. grandis* is infrequent in the Canal Zone. In some places along the Pacific slope of Central America it is abundant, the trees when loaded with their delicately pink blossoms having a striking resemblance to apple trees. The wood is used for construction purposes. The pulp of the pods is edible, and has properties similar to those of *C. fistula*. In Panama *C. grandis* is called "cañafístula"; in Costa Rica "carao" and "sandal"; in Salvador "carago," "caragua," and "caragüe." *C. regia*, an endemic species, collected at Paraíso, is perhaps not distinct from *C. grandis*.

C. occidentalis is a common weed, called "frijolillo," and by the West Indians "dandelion." In Mexico it is called "hediondilla" and "habilla"; in Costa Rica "pico de pájaro"; in Colombia "brusca" and "bicho." In Panama, as elsewhere in Central America, the seeds of this and other species are sometimes used as a substitute for coffee. The plant (probably the leaves as poultices) is employed here as a remedy for inflammation. *C. confusa*, which has been collected at Bella Vista, is called "frijolillo."

C. pilifera is common, and *C. indecora* occasional. *C. pallidior* has been collected at Alhajuela. *C. leiophylla* is frequent on the Pacific slope. A tea made from the plant is said to be used as a remedy for colds. *C. tora* is a common weed, called by the Jamaicans "dandelion," and by the Barbadians "white broom."

C. alata is a frequent shrub, easily recognized by the broadly winged pods. By the Barbadians it is called "cure-all," and is used medicinally. In Jamaica it is known as "ringworm shrub," and is used, as elsewhere, as a remedy for ringworm and other cutaneous diseases. In Salvador and Guatemala this species is called "barajo"; in Colombia "bajagua," "mocuteno," and "lucutema"; in Porto Rico "talantola" and "talantro." *C. nicaraguensis* has been collected near Alhajuela. *C. reticulata* is a common shrub or small tree, very similar in appearance to *C. alata.* It is known here as "laureño"; in Salvador as "sambrán," "barajo," and "barajillo"; in Costa Rica as "saragundín"; in Venezuela as "tarantán."

C. siamea, a native of tropical Asia, is planted commonly as a shade tree in Balboa and elsewhere.

5. DIALIUM L.

Dialium divaricatum Vahl, the only Central American species, has been collected on the Atlantic slope. It is a tree with odd-pinnate leaves, and small flowers in large panicles. The fruit is subglobose or ovoid, about 2 cm. long, and 1-seeded.

6. BAUHINIA L.

Leaves with 2 leaflets .... 1. **B. eucosma** Blake.
Leaves 2-lobed.
  Plants armed with short spines. Erect shrub .... 2. **B. pauletia** Pers.
  Plants unarmed.
    Plants erect, planted for ornament. Lobes of the leaves rounded at apex. 3. **B. purpurea** L.
    Plants scandent, native.
      Lobes of the leaves acute; plants without tendrils. 4. **B. excisa** (Griseb.) Hemsl.
      Lobes of leaves very obtuse; plants with tendrils ... 5. **B. standleyi** Rose.

Other species are found in Panama. The racemose flowers have 4 petals and 10 or fewer perfect stamens; the pods are linear or oblong, flat, and dehiscent.

B. eucosma, an endemic species of the Pacific slope, is a large vine with white flowers. The vernacular name is "bejuco de cadena." The stems are used as cordage. The dry valves of the pod, which are twisted like the propellers of a boat, are used by children for making windmills. In *B. pauletia*, a common shrub on the Pacific slope, the flowers are greenish white and unattractive. In Nicaragua this species is called "espino blanco"; in Salvador "pie de venado" and "garrabatillo"; in Honduras "vainilla."

B. purpurea is a handsome shrub, native of southern Asia, planted here for ornament. The large flowers are rose-purple or white. *B. excisa*, which grows on the Atlantic slope, is called "bejuco de cadena" and "bejuco de mono." The former name ("chainvine") is given in reference to the fact that in this, as in some other scandent species, the woody stems are flattened and ribbon-like, and perforated with numerous holes. *B. standleyi* is an endemic species of the Pacific slope, with small, greenish white flowers. It is called "bejuco de culebra."

Sterile specimens of another species of *Bauhinia* have been collected in the Atlantic forests. This is a large vine, the leaves with 2 large leaflets which are acuminate, and beneath densely sericeous with fine glistening hairs.

7. PELTOGYNE Vog.

Peltogyne purpurea Pittier, described from the Province of Darién, is said to to grow in our region, although I have seen no specimens. It is a large glabrous deciduous tree, 25 to 60 meters high, known as "nazareno" and "morado."

The 2 leaflets are acuminate; the pods semiorbicular, 3 cm. long, and 1-seeded. The wood is very hard, the sapwood white, the heartwood of a handsome purple color.

8. **CYNOMETRA** L.

Cynometra bauhiniaefolia Benth. is reported from Paraíso by Hemsley. It is a tree, the leaves with a single pair of semiovate obtuse leaflets. The small flowers are racemose, the pods leathery, little compressed, and bivalvate.

9. **HYMENAEA** L. COURBARIL

Hymenaea courbaril L. (pl. 33), frequent about the Pacific slope, is a small tree, the leaves composed of 2 asymmetric acute leathery leaflets 5 to 10 cm. long. The large, whitish or purplish flowers are borne in small terminal panicles. The pod is oblong, about 10 cm. long, with very thick, hard valves, and is usually 2-seeded.

In some parts of its range this species is a tree of 30 meters, with a trunk 2 meters in diameter. The dark brown or orange, hard and heavy, strong, tough, and fairly durable wood is much used in carpentry and construction work of all kinds. The bark, removed in a single large piece, is sometimes utilized by the Indians for making canoes, and it is reported that canoes with a capacity of 25 men are sometimes fashioned thus. A pale yellow or reddish gum, known in trade as South American copal, exudes from the trunk. This gum often becomes buried in the soil about the roots, to be dug up by collectors, sometimes long after the tree has decayed. It is employed in the manufacture of varnish, as well as for incense in churches, and for medicinal purposes. The sweet mealy pulp about the seeds is edible.

In Panama the tree is called "algarrobo," a name applied also in Cuba, Porto Rico, and Venezuela. This term, of Arabic origin, is applied in Spain to the carob or "St. John's bread," *Ceratonia siliqua*. *Hymenaea courbaril* is called "cuapinol" or "guapinol" in most parts of Central America and Mexico.

10. **BROWNEA** Jacq.

Leaflets thinly tomentose beneath; subscandent shrub; flowers borne near the base of the trunk..........................**1. B. macrophylla** Linden.

Leaflets glabrous or nearly so; tree; flowers borne on leafy branches. **2. B. ariza** Benth.

Other species occur in Panama. The plants have even-pinnate leaves with few pairs of large oblong acuminate leaflets. The red flowers are crowded in headlike clusters; the pods are large, flat, and dehiscent.

B. macrophylla, which is frequent in swamps near the Atlantic coast, is one of the most striking and beautiful plants of the region. It is usually a shrub of 3 to 6 meters, reclining upon trees. The leaf buds are surrounded by scarious brown scales 20 cm. long or larger. The flowers are of an intense fiery red, in dense rosette-like clusters 10 to 15 cm. in diameter. The plants grow in *Manicaria* swamps, where at midday there is scarcely more than twilight, yet the flowers are so vividly colored that they seem almost aflame.

B. ariza is a Colombian species that is, or at least was formerly, in cultivation in Ancón. It is a handsome tree with "scarlet-pink" flowers.

11. **PRIORIA** Griseb.

Prioria copaifera Griseb. (pl. 34), one of the common species in the forests of the Atlantic slope, is a large tree, the trunk often 1.5 meters in diameter, and 12 meters to the limbs. The leaves have 2 pairs of large acuminate glabrous leaflets. The small flowers, with no petals, are arranged in panicled racemes; the 1-seeded pods are flat, brown, about 8 cm. long and nearly as broad. The brownish wood is little used.

In Panama the tree is called "cativo" and "amansa mujer"; in Colombia, "trementino." Peccaries are said to be fond of the fallen pods. The tree grows best in areas that are flooded during the rainy season, and such places are called *cativales*. The village of Catival, near Colón, derives its name from this tree.

12. **DIMORPHANDRA** Schott

The only Central American species is *D. megistosperma* Pittier (pl. 35), described from the region of Chepo and occurring also in Darién. It is probably this species that is reported from the zone by Hemsley, under the name *D. oleifera* Triana. *D. megistosperma* is a large tree, 15 to 45 meters high, often with buttressed trunk. The leaves have 2 pairs of oblong leaflets 10 to 18 cm. long, and the small flowers are in dense spikes. The pods are 25 cm. long and 13 cm. wide or smaller. The seeds attain a size of 18 by 12 cm., and are perhaps the largest dicotyledonous seeds known. From them the natives obtain a dark red dye. The wood is hard and reddish, taking a beautiful rich finish, and is said to be very durable. The vernacular name is "alcornoque."

13. **COPAIVA** Jacq.

Copaiva officinalis Jacq., occasional about the zone, is a tree with even-pinnate leaves, the few leaflets oblong-ovate, 2.5 to 7 cm. long. The small apetalous flowers are arranged in panicled racemes; the fruit is subglobose, somewhat compressed, 2.5 cm. long, 1-seeded, and bivalvate. The leaflets are usually dotted with transparent glands.

The wood of all species of *Copaiva* (often known as *Copaifera*) contains gum canals which secrete the commercial product called copaiba balsam, copaiva balsam, or balsam capivi. This collects in cavities in the heart of the tree. In the crude state it is used by the natives for medicinal purposes and for annointing their hair and bodies. Commercially it is used in medicines and for the manufacture of varnishes. Most of the commercial product comes from Venezuela and the Amazon Valley.

14. **TAMARINDUS** L. TAMARIND

The only species is *T. indica* L., native of the East Indies, commonly planted in Central America and in some localities thoroughly naturalized. It is planted occasionally about the zone. It is a tree with pinnate leaves, the numerous oblong obtuse leaflets 1 to 2 cm. long. The rather large flowers, yellow striped with red, are borne in panicled racemes. The pods are 5 to 15 cm. long, about 2 cm. thick, brown, and indehiscent, containing 4 to 7 seeds surrounded by a juicy red pulp.

The Spanish name is "tamarindo." The acidulous pulp of the pods is esteemed in tropical America for flavoring beverages and ices.

65. FABACEAE. Bean Family

Stamens free. Shrubs or trees.
  Petal one; pods neither compressed nor winged.............**1. TOUNATEA.**
  Petals 5; pods compressed or winged.
    Pods 1-seeded, swollen at the apical end, winged below; leaves with transparent dots.................................**2. TOLUIFERA.**
    Pods containing 1 or more seeds, not winged; leaves not with transparent dots.

Stamens long-exserted. Pods compressed ---------- 3. **SWEETIA.**
Stamens not exserted.
Calyx shallowly dentate; seeds brown ---------- 4. **SOPHORA.**
Calyx deeply lobate; seeds red and black ---------- 5. **ORMOSIA.**
Stamens united below, or sometimes one free from the others.
Fruit consisting of several 1-seeded joints, rarely by abortion 1-seeded. Plants herbaceous.
Leaves with 5 to many leaflets.
Leaflets 5; plants scandent ---------- 13. **CHAETOCALYX.**
Leaflets numerous; plants not scandent ---------- 14. **AESCHYNOMENE.**
Leaves with 2 to 4 (rarely 1) leaflets.
Stipels present at base of petiolules ---------- 15. **MEIBOMIA.**
Stipels none.
Leaflets 3; calyx tube elongate ---------- 16. **STYLOSANTHES.**
Leaflets 3 or 4; calyx tube short ---------- 17. **ZORNIA.**
Fruit not jointed.
Hairs of the pubescence appressed, attached by the middle. Plants herbaceous or suffrutescent; pods linear, indehiscent; flowers small, reddish ---------- 7. **INDIGOFERA.**
Hairs attached by their bases.
Leaflets 5 or more. Plants not scandent, except in *Abrus* and *Machaerium*, which are woody vines.
Leaves even-pinnate.
Plants scandent; seeds red and black ---------- 18. **ABRUS.**
Plants erect; seeds not red ---------- 12. **SESBANIA.**
Leaves odd-pinnate.
Pods 2-valvate, dehiscent, sometimes inflated and bladder-like.
Pods inflated, bladder-like. Trees with yellow flowers. 8. **DIPHYSA.**
Pods not inflated.
Pods with partitions between the seeds. Plants herbaceous or suffrutescent ---------- 9. **BENTHAMANTHA.**
Pods without cross partitions.
Plants herbaceous ---------- 10. **TEPHROSIA.**
Plants trees ---------- 11. **GLIRICIDIA.**
Pods indehiscent. Trees or large shrubs.
Fruit drupaceous.
Flowers purple; leaflets symmetric; calyx shallowly dentate. 35. **ANDIRA.**
Flowers pink; leaflets very asymmetric; calyx 2-lipped. 36. **COUMAROUNA.**
Fruit not drupaceous.
Leaflets opposite.
Fruit torulose, terete ---------- 37. **MUELLERA.**
Fruit compressed.
Flowers yellow; wing petals free from the keel; ovule 1. 38. **PLATYMISCIUM.**
Flowers purple; wing petals adherent to the keel; ovules usually several ---------- 39. **LONCHOCARPUS.**
Leaflets alternate.
Fruit coiled, not winged ---------- 40. **DREPANOCARPUS.**
Fruit not coiled.
Pods not winged ---------- 41. **DALBERGIA.**

Pods winged.
  Wing surrounding the body of the fruit. Unarmed trees ---------------------- 42. **PTEROCARPUS.**
  Wing of fruit basal or terminal.
    Wing of fruit basal; unarmed trees. 43. **PLATYPODIUM.**
    Wing of fruit terminal; shrubs, usually scandent and armed with recurved spines -- 44. **MACHAERIUM.**

Leaflets 3 or fewer. Plants mostly scandent and herbaceous, erect and woody in *Erythrina* and *Dalbergia*.
  Leaflet 1, or the leaves digitately 3-foliolate. Plants erect.
    Plants woody; leaflet 1; fruit compressed ------ 41. **DALBERGIA.**
    Plants herbaceous; leaflets 1 or 3; fruit terete -- 6. **CROTALARIA.**
  Leaflets 3, the leaves pinnate (leaflet 1 in one species of *Bradburya* with scandent stems).
    Flowers with either the keel or the standard very large, making the flower different in appearance from the normal papilionaceous flower.
      Plants shrubs or trees, erect, usually prickly; standard much larger than the other petals ------------ 19. **ERYTHRINA.**
      Plants scandent, chiefly herbaceous, unarmed; keel larger than the other petals -------------------------- 20. **MUCUNA.**
    Flowers of the normal papilionaceous type.
      Nodes of the inflorescence not swollen.
        Pods usually 2-seeded. Flowers yellow.
          Plants erect -------------------------- 21. **ERIOSEMA.**
          Plants scandent -------------------- 22. **RHYNCHOSIA.**
        Pods with more than 2 seeds.
          Flowers yellow, striped or tinged with red; plants erect; pods impressed between the seeds ------------ 23. **CAJANUS.**
          Flowers purple, pink, blue, or whitish; plants usually scandent; pods not impressed between the seeds.
            Style bearded; plants sometimes woody or erect. 24. **CLITORIA.**
            Style glabrous; herbaceous vines.
              Bracts persistent; standard spurred or gibbous. 25. **BRADBURYA.**
              Bracts deciduous; standard unappendaged. 26. **TERAMNUS.**
      Nodes of the inflorescence more or less swollen. Plants climbing or prostrate vines.
        Style glabrous, or pubescent at base.
          Calyx conspicuously 2-lipped ------------ 27. **CANAVALIA.**
          Calyx not conspicuously 2-lipped.
            Vexillar stamen united with the others. Large, somewhat woody vines -------------------------- 28. **DIOCLEA.**
            Vexillar stamen free.
              Upper calyx lobe 2-dentate. Herbaceous or woody vines. 29. **CALOPOGONIUM.**
              Upper calyx lobe entire. Small herbaceous vine. 30. **GALACTIA.**
        Style bearded on the inner side, at least above. Herbaceous vines.
          Keel spirally coiled -------------------- 31. **PHASEOLUS.**

Keel curved but not spirally coiled.
  Pods oblong; stigma terminal............32. **DOLICHOS.**
  Pods linear; stigma oblique or lateral.
    Style flattened above; roots tuberous; flowers purple.
      33. **PACHYRHIZUS.**
    Style not flattened; roots fibrous; flowers yellow or purplish..............................34. **VIGNA.**

1. TOUNATEA Aubl.

Pods flat, 7 to 10 cm. wide; racemes many-flowered; leaflets 5.
  1. **T. panamensis** (Benth.) Taub.
Pods terete, 2 cm. or less in diameter; racemes mostly 2 to 5-flowered; leaflets usually 1 or 3..........................2. **T. simplex** (Swartz) Taub.

The genus is sometimes known as *Swartzia*. The plants have large flowers, each with a single yellow petal. *T. panamensis*, an endemic species, occurring in forests along the Chagres watershed, is a tree of 6 to 20 meters. *T. simplex* (of which *Swartzia darienensis* Pittier is probably a synonym) is a frequent shrub or small tree. It is known locally as "naranjillo," a term used in Mexico, where the name "limoncillo" also is employed. *T. myrtifolia* (J. E. Smith) Taub. has been reported from the zone, but it is doubtful whether the Panama form can be distinguished from *T. simplex*. Another species, *Swartzia arborescens* (Aubl.) Pittier, has been reported from Taboga, but has not been found recently.

2. TOLUIFERA L. BALSAM-OF-PERU

Toluifera pereirae (Klotzsch) Baill. (*Myroxylon pereirae* Klotzsch) is planted as a shade tree and is probably native here, for it grows at Chepo and in Darién. It is a tall slender tree with smooth pale bark. The 7 to 11 leaflets are ovate or oval, 3 to 7 cm. long, obtuse or acuminate, glabrous, and when held to the light are seen to have many translucent dots and lines. The small flowers are in short racemes; the fruit is 1-seeded, about 10 cm. long, the seed borne in the thick terminal end, the lower part broadly winged.

The balsam tree is widely distributed in Central America and occurs in southern Mexico and northern South America. It is most abundant in Salvador, one part of which is known as the Balsam Coast. The hard, heavy, reddish brown wood takes a good polish. It is used for many purposes, particularly interior finish and railroad ties. Some is exported to the United States, where it is valued for cabinet work.

The most important product of the tree is the balsam or "balsam-of-Peru." In early days the balsam gathered in Salvador was sent to Callao, Peru, for transshipment to Spain, and it thus came to be known erroneously as balsam of Peru. The balsam, a fragrant viscous substance with bitter flavor, is found in all parts of the plant, and is sometimes extracted from the crushed fruit. It is obtained chiefly from incisions in the trunk, rags being placed in these to absorb the sap. By a papal bull issued by Pius IV in 1562 and by another by Pius V in 1571 the clergy were authorized to use the balsam in the preparation of the chrism, and it was declared a sacrilege to destroy or injure the trees. The balsam is still employed for this purpose, but its most general use is in the preparation of ointments and perfumes. It is an official drug of the United States Pharmacopoeia, being employed occasionally in the treatment of catarrh, asthma, rheumatism, and venereal diseases.

The tree is known usually as "bálsamo," "árbol de bálsamo," or "palo de bálsamo."

3. SWEETIA Spreng.

The only Central American species, *S. panamensis* Benth., is occasional in forests. It is a medium-sized tree with odd-pinnate leaves, the leaflets ovate or oblong-elliptic, lustrous above and pale beneath. The small whitish flowers are borne in axillary panicles; the fruit is thin, 1 or 2-seeded, and about 2 cm. wide. The Panama name is "malvecino." In Salvador and Honduras the tree is called "chichipate;" in Costa Rica "carboncillo;" in Mexico "huesito" or "huesillo;" in British Honduras "Billy Webb." The wood is used locally for construction purposes.

4. SOPHORA L.

The only Central American species, *S. tomentosa* L., is reported from Colón by Hemsley. It is a shrub with sericeous leaves, the 11 to 17 leaflets oblong or oval. The yellow flowers are borne in terminal racemes; the pods are terete, long-stalked, 5 to 10 cm. long, and deeply constricted between the seeds.

5. ORMOSIA Jacks.

Ormosia coccinea (Aubl.) Jacks. is reported from Río Grande by Hemsley. It is a large tree, the leaves with 7 or 9 oblong leaflets, the dark purple flowers in panicles. The pods are 1 to 4-seeded, about 2.5 cm. wide, the seeds red and black.

6. CROTALARIA L. RATTLEBOX

Leaves simple.
  Stipules none or minute; flowers about 2 cm. long. Pubescence of minute, closely appressed hairs............**1. C. retusa** L.
  Stipules present, conspicuous, usually decurrent as wings on the stems; flowers about 1 cm. long.
    Pubescence of closely appressed hairs............**2. C. pterocaula** Desv.
    Pubescence of loose spreading hairs............**3. C. sagittalis** L.
Leaves with 3 leaflets.
  Pubescence of loose spreading hairs; leaflets nearly as broad as long, broadly rounded at apex............**4. C. incana** L.
  Pubescence of closely appressed hairs; leaflets acute, or obtuse but then narrowly oblanceolate-oblong.
    Racemes all terminal; leaflets oblong or oblanceolate-oblong, obtuse. **5. C. maypurensis** H. B. K.
    Racemes mostly opposite the leaves; leaflets ovate or lanceolate, acute or acuminate............**6. C. vitellina** Ker.

The Crotalarias are annual or perennial herbs, or sometimes shrubs, with short or long racemes of yellow flowers. The pods are inflated and when dry the seeds rattle about inside, hence the name rattlebox.

C. retusa is a frequent weed. In Costa Rica it is called "quiebra-plato," "gallincillo," and "patillo"; in Porto Rico "matraca" and "sonajuelas." *C. pterocaula,* which occurs in grassland near the Pacific, is a tall slender annual with few branches. The local name is "frijolillo" ("little bean"), a term applied in Central America to many small plants of this family. *C. sagittalis* also seems to be confined to the Pacific slope. In Salvador it is given the names "chinchín," "cohetillo," and "espadilla"; in Guatemala "chipilín de montaña."

C. incana a common tropical weed, is called here "frijolillo"; in Salvador "chinchín," "chipilín macho," "chipilín," "chipilín de zope," and "chipilín de venado." *C. maypurensis* is rare locally, but has been found near Juan Franco. *C. vitellina* is a common weedy species, herbaceous or somewhat shrubby, with showy flowers. Locally it is called "zapatito del obispo"; in Salvador "chipilín," "chipilín de venado," "chipilín macho," and "cohetillo"; in Mexico "tronador." In Salvador the young shoots of this and related species are a popular vegetable, being cooked like spinach.

7. INDIGOFERA L. Indigo

Leaves mostly with 1 to 3 leaflets, sometimes with 5 leaflets. Pods straight. 1. **I. lespedezioides** H. B. K.

Leaves mostly with 7 to 19 leaflets.

- Teeth of calyx longer than the tube; leaflets bright green; pods many-seeded, straight ---------- 2. **I. mucronata** Spreng.
- Teeth of calyx shorter than the tube; leaflets grayish; pods few (usually 3 to 6) seeded.
  - Pods straight, constricted between the seeds, tapering into a long slender beak ---------- 3. **I. panamensis** Rydb.
  - Pods strongly curved, not constricted between the seeds, abruptly contracted into a short beak ---------- 4. **I. suffruticosa** Mill.

The plants are herbs or shrubs with odd-pinnate leaves, small reddish flowers in racemes, and small pods which are not compressed and are indehiscent. The pubescence of the leaves is characteristic, consisting of short appressed needle-like hairs which are attached by their middle.

I. lespedezioides is a low herb, frequent in savannas near the Pacific coast. It is called "guapito" in Salvador. *I. mucronata* is a common herbaceous weed, often clambering over shrubs. *I. panamensis*, endemic in Panama and confined to the Pacific slope, is a shrub 1 to 2 meters high.

I. suffruticosa (*I. anil* L.), also shrubby and 1 to 2 meters high, is very common in the drier parts of Central America, and sometimes a bad weed. It is from this species that Central American indigo is obtained, although in other parts of the world other species are utilized for the production of indigo. In former years, before the introduction of coffee, indigo was the principal agricultural product exported from Central America, and small quantities are still produced, chiefly in Salvador, although the natural indigo has been largely supplanted in commerce by the artificial synthetic article. In order to separate the dyestuff the cut plants were fermented in vats of water, after which they were thoroughly kneaded by men trampling upon them. The indigo settled to the bottom as a precipitate, and was made into cakes, which were dried. For export indigo is formed into balls about the size of a water bucket, which are covered with rawhide. The system necessary for its separation from the plant is injurious to the health of persons who work with it, hence it is not to be regretted that the industry has declined. The usual word for indigo in Central America is "añil," and the plant is most commonly known as "jiquelite" (from the Aztec, meaning "turquoise-herb"). The use of indigo as a dye was well known to the aborigines of tropical America.

8. DIPHYSA Jacq.

A common tree is *D. robinioides* Benth. It is of medium size, the leaves with 11 to 21 elliptic leaflets about 2.5 cm. long, rounded at apex, glabrous, and pale beneath. The bright yellow flowers, 1.5 cm. long, are borne in short racemes. The pods are thin-walled and inflated, about 6 cm. long and 1.5 to 2 cm. wide. The hard, heavy, fine-grained, yellow wood is very durable, and yields a yellow dye. It is used locally for construction purposes and for railroad ties. In Salvador the bark is sometimes employed as a remedy for malaria. In Panama the tree is called "macano" and "cacique"; in Salvador and Costa Rica "guachipilín" or "huachipilín"; in Guatemala "palo amarillo"; in Mexico "cuachepil."

9. BENTHAMANTHA Alef.

Benthamantha panamensis Rydb., described from Alhajuela, is a low suffrutescent plant, the leaves with 11 to 15 elliptic leaflets 1 to 2.5 cm. long, the purplish flowers in axillary racemes. The pod is linear, glabrous, about 3 mm. wide.

10. TEPHROSIA Pers.

Pubescence of the stems appressed; leaflets 7 or 9; racemes terminal.
1. T. nitens Benth.

Pubescence of the stems spreading; leaflets 21 to 29; racemes axillary.
2. T. heydeana (Rydb.) Standl.

The name *Cracca* is sometimes used for the genus, of which at least one other species is known from Panama. The plants are herbs with odd-pinnate leaves and racemes of rather showy purplish flowers. The fruit is a narrow, straight or somewhat curved, pubescent, flat pod.

T. nitens is common on grassy hillsides of Taboga Island, whence it was described. *T. heydeana* has been collected only on the Pacific slope.

11. GLIRICIDIA H. B. K. MADRE DE CACAO

Gliricidia sepium (Jacq.) Steud. (pl. 36) is a frequent tree, seldom attaining a great size. The leaves are odd-pinnate, with 7 to 15 elliptic leaflets which are usually blotched with purple beneath. The flowers are borne in great profusion in axillary racemes, usually when the tree is leafless; they are pink and about 2 cm. long. The pod is linear, compressed, 10 to 15 cm. long and 1.5 cm. wide, and glabrous. The flowers are very showy, and the general aspect of the tree suggests the common locust (*Robinia pseudoacacia*) of the United States, to which it is closely allied.

The tree is widely distributed, ranging from Mexico to the West Indies and northern South America. Along the western coast of Central America it often forms extensive, almost pure stands at low elevations. It is frequently planted for hedges, and often as shade for cacao and coffee. In preconquest days the aborigines had learned that cacao thrived unusually well in the shade of this tree, hence the Mexicans called it "cacahuanantl," "cacao-mother," translated later into Spanish as "madre de cacao," the name now most widely applied to *Gliricidia*. It is probable that the favorable effect of the tree upon the growth of cacao results from beneficial nitrogen-fixing bacteria which form nodules upon the roots, as is the case with many leguminous plants.

The wood is reddish brown, hard, heavy, tough, close-grained, taking a good polish, and is very durable, being employed for many purposes. The leaves and seeds are often used for poisoning rats, mice, and other rodents. In Salvador as well as elsewhere the flowers are fried and eaten, being of good flavor when so prepared. In Panama the leaves are applied as poultices to relieve bruises, sores, erysipelas, and similar affections.

About the zone this tree is called "bala" or "balo" and "madera negra," and the names "mata-ratón" and "madre de cacao" are employed in Panama. In Salvador it is called also "palo de hierro"; "sangre de drago" in Costa Rica; "madriado" in Nicaragua; "cacahuananche" in Mexico; "bien vestido" and "piñón florido" in Cuba.

12. SESBANIA Adans.

Corolla 6 to 8 cm. long, white or purple; pods 5 to 7 mm. wide.
1. S. grandiflora (L.) Pers.

Corolla about 2 cm. long, yellow; pods 2 to 3 mm. wide.
2. S. emerus (Aubl.) Urban.

The Sesbanias have even-pinnate leaves with oblong obtuse leaflets, and flowers in axillary racemes. The pods are very long and slender. *S. grandiflora* is planted for ornament in Balboa and elsewhere, and is sometimes found wild. It is usually a small tree but often flowers when it is an herb less than a meter high. The pods are pendent, and the flowers showy and handsome. The plant is a native of tropical Asia. In Yucatán it is called "pico de flamenco"; in Porto Rico "gallito" and "cresta de gallo." *S. emerus* grows in wet fields on the Pacific slope. It is a large herb, called "baripozo" and "flor de arito" in Salvador.

13. CHAETOCALYX DC.

The only Central American species, *C. latisiliqua* (Desv.) Benth., common in thickets, is a slender herbaceous vine. The leaves have 5 elliptic leaflets, pale beneath; the bright yellow flowers are in axillary racemes. The fruit is about 6 cm. long, finely pubescent, breaking up into numerous square joints.

14. AESCHYNOMENE L.

Stipules not produced below the point of attachment to the stems; fruit with 2 or 3 joints; leaflets few, obovate.
  Fruit 2-jointed; racemes mostly shorter than the leaves___1. **A. hystrix** Poir.
  Fruit 3-jointed; racemes longer than the leaves__2. **A. brasiliana** (Poir.) DC.
Stipules produced below the point of attachment; fruit with more than 3 joints; leaflets numerous, oblong or linear.
  Leaflets acute, the costa close to the margin. Plants hirsute. 3. **A. americana** L.
  Leaflets obtuse, the costa remote from the margin.
    Stems and fruit glabrous or glandular-scabrous__4. **A. sensitiva** Swartz.
    Stems and fruit hirsute__________________________5. **A. hispida** Swartz.

The plants are small or large herbs with small, yellow or dull red flowers. The pods are jointed and are notched along one edge.

A. hystrix has been collected on Taboga. *A. brasiliana* is common, especially on the Pacific slope, and is called "pega-pega." The flowers of both these species are buff. *A. americana*, a very common weed with dull yellow and purple flowers, likewise is called "pega-pega" here, while in Salvador it is known as "plumón" and "antejuela." *A. sensitiva* and *A. hispida* grow usuallly in open swamps.

15. MEIBOMIA Heist. TICKCLOVER

Flowers fascicled, in the axils of the leaves. Plants very slender, creeping; leaflets obovate-orbicular, usually notched at apex, less than 1 cm. long; pod notched only on the lower side______1. **M. triflora** (L.) Kuntze.
Flowers in racemes or panicles.
  Calyx covered with long stiff tawny hairs; flowers in very short, congested, terminal racemes; pedicels hooked__________2. **M. barbata** (L.) Kuntze.
  Calyx short-pubescent, the hairs often appressed; racemes elongate, loosely flowered; pedicels not hooked.
    Joints of the pod about 3 times as long as broad. Leaflets rounded at apex, often notched________________3. **M. scorpiurus** (Swartz) Kuntze.
    Joints of the pod less than twice as long as broad.
      Joints of the pod notched on the upper edge. Pods with 1 or 2 fertile joints.
        Plants scandent; pods stipitate, about 10 mm. broad. 4. **M. infracta** (DC.) Blake
        Plants erect; pods sessile, about 5 mm. broad. 5. **M. mollis** (Vahl) Kuntze.

- Joints not notched on the upper edge.
  - Leaflet one, linear. Pods notched along both edges. 6. **M. angustifolia** (H. B. K.) Kuntze.
  - Leaflets 3, broad.
    - Pods straight along the upper edge, notched along the lower edge, not twisted.
      - Plants trailing, rooting at the nodes; pods with usually 2 joints. Leaflets obtuse or acute____7. **M. axillaris** (Swartz) Kuntze.
      - Plants erect or ascending, not rooting at the nodes; pods with more than 2 joints.
        - Leaflets acute, mostly 4 to 8 cm. long. 8. **M. cana** (Gmel.) Blake.
        - Leaflets broadly rounded at apex, mostly 1 to 3 cm. long. 9. **M. adscendens** (Swartz) Kuntze.
    - Pods notched along both edges, often twisted.
      - Pods notched much more deeply along the lower than along the upper edge, not twisted. Pods sessile or nearly so; plants stout, erect__________10. **M. cajanifolia** (H. B. K.) Kuntze.
      - Pods notched equally deep along both edges.
        - Plants perennial; inflorescence viscid-pubescent; pods usually not twisted at maturity.
          - Joints of the pod 3 mm. wide or broader. 11. **M. purpurea** (Mill.) Vail.
          - Joints 2 mm. wide___________12. **M. aspera** (Poir.) Kuntze.
        - Plants annual; inflorescence not viscid-pubescent; pods much twisted at maturity.
          - Pedicels much longer than the pods, usually several times as long________________13. **M. tenella** (H. B. K.) Kuntze.
          - Pedicels shorter than the pods. 14. **M. procumbens** (Mill.) Britton.

The name *Desmodium* is often used for the genus, of which at least two other species are known from Panama. The plants are herbs or shrubs, the leaves mostly with 3 leaflets, the flowers small and purple, the pods consisting of 2 or more flat joints. Some members of the genus have value as forage for stock.

M. triflora, a common weed, by its habit somewhat suggestive of white clover, is said to be called clover in the Changuinola Valley. In Salvador it is called "hierba cuartillo." *M. barbata* also is common, especially in grassland. Like the other species it is known here as "pega-pega," while in Salvador it is sometimes called "caraguillo." *M. scorpiurus* is a too common weed almost everywhere in Central America. As in most other species, the joints of the pod are covered with small hooked hairs, by which they adhere tenaciously to clothing. In Salvador this species is sometimes given the name of "hierba de Santa Teresa."

M. infracta has not been found here recently, but Hemsley reports it (as *Desmodium barclayi* Benth.) from Paraíso. *M. mollis* is occasional near Panama City, and is called "pega-pega." *M. angustifolia* also is occasional on the Pacific slope. Its Salvadorean name is "lengua de pájaro." *M. axillaris* is frequent. The name "guavitas" is sometimes applied to its fruits. In Guatemala it is called "mozote," and "pega-pega." *M. cana* is an abundant weed. Here it is called "pega-pega," and at Olá "pegadera," while among the West Indians it is known as "strong-back," and is used medicinally. I was also given the Barbadian name as "John Charles," but this is probably erroneous. On Taboga the vernacular name was given as "cepa de caballo," but this name also may be incorrect.

M. cajanifolia is frequent, herbaceous or woody, often 3 meters high, rather showy because of the large flower panicles. The local name is "pega-pega"; the West Indians give to it, as well as to other species, the names "strong-back" and "strong-bark." *M. purpurea* is another common weed, but *M. aspera* is scarce. The latter is sometimes called "alfalfa montés" in Salvador. *M. tenella* is a rather scarce plant, but *M. procumbens* is abundant. The latter is called "pegajoso" in Mexico.

16. STYLOSANTHES Swartz

Pod with a minute recurved beak............1. **S. guyanensis** (Aubl.) Swartz.
Pod with a long slender coiled beak..................2. **S. humilis** H. B. K.

Both species are common on the Pacific slope, especially in savannas. They are small herbs with 3-foliolate leaves and small yellow flowers, the fruit consisting of 1 or 2 small joints.

17. ZORNIA Gmel.

The only Central American species, *Z. diphylla* (L.) Pers., is frequent in grassland on the Pacific slope. It is a small perennial herb, the leaves with 2 acute leaflets, the yellow flowers in slender spikes, subtended by large leaflike 2-ranked bracts. In Salvador the plant is known as "trencilla," "barba de burro," and "zornia." Years ago a physician living at La Unión, Salvador, employed the plant as a remedy for dysentery. He used its Latin name, *Zornia,* which is now in common use among residents of the locality, who have no idea of its real significance. In Costa Rica the name "zornia" is given to a plant of the Acanthaceae.

18. ABRUS L. ROSARY-PEA

Abrus precatorius L. has been found near France Field. It is a slender, woody vine with evenly pinnate leaves, the leaflets 8 to 15 pairs, oblong, 8 to 15 mm. long, the small, white or pink flowers clustered in the axils of the leaves. The flat oblong pod, 2 to 3.5 cm. long and 1 cm. wide, contains several bright red seeds which are black about the hilum. The leaves and root have the flavor of licorice. The leaves droop vertically during hours of darkness and rise to a horizontal position in daylight. The plant is reported as poisonous to cattle, and the seeds are said to have been used for criminal poisoning. The brightly colored seeds are often strung as necklaces and bracelets. Because of their uniformity in size they were formerly used as weights by jewel merchants. In commerce they are known as "jiquirity seeds," having been employed by European physicians in treating diseases of the eye and skin. Workmen engaged in drilling holes in the seeds, in order to string them for necklaces, are said to have been poisoned severely. The English names "crab's-eyes" and "wild licorice" are sometimes given to the plant. In Cuba and Porto Rico the seeds are called "peronillas" or "peonías."

19. ERYTHRINA L.

Leaflets rounded or very obtuse at apex, coriaceous, sericeous beneath; flowers orange, the standard 5 cm. wide, long-clawed; calyx campanulate.
1. **E. glauca** Willd.
Leaflets usually acute or acuminate, thin; flowers red, the standard 1.5 cm. wide or less, sessile or short-clawed; calyx tubular. Seeds bright red.
  Leaflets glabrous; calyx cleft on one side........2. **E. rubrinervia** H. B. K.
  Leaflets pubescent beneath; calyx shallowly bilobate.
3. **E. panamensis** Standl.

One other species is known from Panama. The Erythrinas are shrubs or trees, usually armed with short stout prickles, the leaves pinnately 3-foliolate. The flowers are large and showy, racemose, the standard much longer or broader than the other petals. The pods are linear, terete, and constricted between the seeds.

E. glauca is one of the abundant trees of Panama. When in flower in January it is very showy, and for this reason is planted about the towns. It seems to prefer swampy ground, and in the swamps near the Pacific coast forms dense, pure stands. The leaflets assume a vertical position in the evening. The local names are "gallito," "pito," "palo bobo," and "palo santo." In Salvador the tree is called "ahuijote" or "ahuejote," and in Porto Rico "bucago."

E. rubrinervia is a small tree or large shrub, frequent here on the Pacific slope, and abundant in many parts of Central America. It usually flowers when leafless, and the large bunches of flowers are conspicuous, even at a distance. At low elevations the flowers are usually of a rather pale and faded red, but at higher altitudes, as in central Costa Rica, they are of an intense, almost fiery red. The tree is much planted for hedges and living fence posts. In Salvador and Guatemala the flowers and buds are cooked and eaten like string beans, which they resemble in flavor. It is believed popularly that eating much of them induces sleep, which may actually be the case, for the seeds of some species are known to be poisonous, containing a substance which has a powerful paralyzing effect upon the motor system. They are sometimes used for poisoning noxious animals. The trees are planted for coffee shade, a purpose for which they are unsatisfactory, because they shed their leaves during the dry season, and the wood is so soft that they are easily broken by the wind. In Salvador the young leaves, called "quilites," are put in soups and other dishes. The Panama name is "gallito." In Costa Rica the tree is called "poró" and "elequeme;" in Salvador and Guatemala "pito." The name "pernilla de casa" is said to be used at Chepo.

E. panamensis seems to be confined to the forests of the Atlantic watershed. It is called "gallito."

20. **MUCUNA** Adans.

Pods 2 cm. wide or less; seeds about 1 cm. wide. Herbaceous vine; leaflets densely pubescent beneath; flowers black-purple, the standard half as long as the keel or shorter; pods hispid................**1. M. pruriens** (L.) DC.

Pods 3.5 cm. wide or wider; seeds mostly over 2 cm. wide.

- Pods sericeous, deeply constricted between the seeds. Large, herbaceous or woody vine; leaflets densely pubescent beneath; flowers about 3.5 cm. long, the standard much shorter than the keel..**2. M. andreana** Micheli.
- Pods hispid with irritant hairs, not or scarcely constricted between the seeds.
  - Leaflets obliquely ovate or rhombic, densely sericeous beneath. Flowers greenish yellow, about 6 cm. long......**3. M. sloanei** Fawc. & Rendle.
  - Leaflets elliptic, glabrous beneath or thinly strigose.
    - Leaflets glabrous beneath or nearly so; flowers about 5 cm. long, the standard broader than long, flesh-colored or purple..**4. M. urens** (L.) DC.
    - Leaflets strigose beneath; flowers about 7 cm. long, the standard longer than broad, yellow.............................**5. M. rostrata** Benth.

The Mucunas are large, herbaceous or woody vines, with pinnately 3-foliolate leaves. The flowers are arranged in short clusters or racemes, which are often borne on long cordlike pendent peduncles a yard long. The keel has a thickened cartilaginous acute tip.

M. pruriens (pl. 37) is a common plant in thickets. The hairs which cover the pods in this and certain other species are easily detached when dry and penetrate the skin, causing intense irritation. They are particularly dangerous to the eyes. In early days the hairs mixed with molasses were administered, especially to slaves, as a remedy for intestinal parasites, being very effective for the purpose. The English names are cowitch and cowage. In Panama, as well as elsewhere in Central America, the plant is called "pica-pica." Forms of this species are cultivated as a forage crop in the southern United States under the name velvetbean.

M. andreana is found on the Atlantic slope. The large round seeds of this and the following species constitute part of the "sea beans" found on tropical shores and sometimes carried by ocean currents to great distances. The seeds were formerly used in Jamaica for making buttons and snuff-boxes. *M. andreana* is called in Salvador "ojo de venado" ("deer's-eye"), a name applied to seeds of related species.

M. sloanei has been found at Bella Vista. It is called "ojo de venado" in Panama; in Porto Rico "ojo de buey" and "matos." *M. urens* is frequent here, being called "chocho," and *M. rostrata* grows in forests of the Atlantic slope.

21. **ERIOSEMA** Desv.

Eriosema crinitum Desv. is frequent in grassland on the Pacific slope. It is a low erect perennial herb, copiously hirsute, with subsessile 3-foliolate leaves and small, pale yellow flowers. Several other species occur in Panama.

22. **RHYNCHOSIA** Lour.

Calyx much shorter than the corolla. Stems terete.
  Pods about 8 mm. wide, constricted between the seeds; seeds red and black; flowers 6 to 7 mm. long..............**1. R. pyramidalis** (Lam.) Urban.
  Pods 4 mm. wide, not constricted between the seeds; seeds grayish; flowers 4 to 5 mm. long..............................**2. R. minima** (L.) DC.
Calyx, at least the lower lobes, equaling or exceeding the corolla. Seeds brown or grayish.
  Stems terete; calyx lobes 3-nerved..................**3. R. calycosa** Hemsl.
  Stems sharply 3-angled; calyx lobes pinnate-nerved.
    Calyx in anthesis 8 to 10 mm. long; racemes usually dense. **4. R. reticulata** (Swartz) DC.
    Calyx 5 to 6 mm. long; racemes remotely flowered. **5. R. hondurensis** (Rose) Donn. Smith.

The name *Dolicholus* is sometimes used for the genus, of which one other species occurs in Panama. The plants are herbaceous or suffrutescent vines, with pinnately 3-foliolate leaves, the broad leaflets dotted beneath with red or yellow glands. The small yellow flowers are in long racemes; the flat oblong pods are 1 or 2-seeded.

R. pyramidalis is occasional on the Atlantic slope. The handsome seeds are sometimes used as beads, and are reputed poisonous. For the plant or its seeds the following names are used: "Ojo de cangrejo" (Salvador, Mexico); "huevos de casapulga" (Salvador); "peonea," "negritos," "frijolillo," "pulguitas," "ojo de zanate" (Mexico); "peronillas" (Colombia); "pitillo" (Guatemala, Honduras).

R. minima is common, also *R. calycosa* and *R. reticulata* (*Dolicholus angulatus* Standl.). *R. hondurensis* is frequent near the Pacific coast.

23. **CAJANUS** DC. PIGEONPEA

The only species, *C. bicolor* DC., is frequent in thickets and is also cultivated commonly. It is an erect herb or shrub, often 2 meters high. The leaves have 3 oblong or elliptic leaflets, which are acute, and finely pubescent beneath. The yellow and red flowers are borne in stalked axillary racemes. The linear pods are 5 to 8 cm. long and 1 cm. wide, finely pubescent, the valves impressed between the whitish or gray seeds. The plant is perhaps a native of tropical Asia, but it is grown in many parts of Central America for its edible seeds. In Panama it is called "guandú" and "frijol de palo," and by the West Indians "goongo pea," perhaps a derivative of "Congo pea." Other names are "timbolillo," "quinbolillo," "frijolillo" (Costa Rica); "cachito" (Guatemala); "alberga," "alverja" (Salvador); "chicharros," "quinconcho" (Venezuela); "gandul," "gandures" (Porto Rico).

24. CLITORIA L.

Leaflets 5 to 9. Herbaceous vine; corolla bright blue, about 4.5 cm. long. **1. C. ternatea** L.
Leaflets 3.
  Plants woody, erect or scandent; leaflets acuminate. Corolla pink, about 7 cm. long ---------- **2. C. arborescens** Ait.
  Plants herbaceous; leaflets obtuse or rounded at apex.
    Plants erect; leaflets glabrous or nearly so, linear-oblong; flowers pink and white, 5 cm. long ---------- **3. C. guyanensis** (Aubl.) Benth.
    Plants climbing; leaflets densely pubescent beneath, oval or elliptic; flowers creamy white with purple markings, about 4 cm. long. **4. C. rubiginosa** Juss.

Clitoria ternatea, a native of the Old World Tropics, is commonly planted for ornament in Central America, and has become naturalized locally about the zone. The large blue flowers are very beautiful. Here the plant is called "campanilla"; in Salvador "zapatillo de la reina"; in Porto Rico "papito" and "bejuco de conchitas."

C. arborescens is frequent in moist woods. Few plants of the region have such handsome flowers. They are very large and of an exceptionally delicate shade of pink. The local name is "peronil." *C. guyanensis* grows on Taboga Island, and *C. rubiginosa* is common in woods and thickets.

25. BRADBURYA Raf.

Leaflet 1, sagittate; petioles winged ---------- **1. B. sagittata** (Humb. & Bonpl.) Rose.
Leaflets 3, not sagittate; petioles not winged.
  Leaflets linear-oblong or linear, the lateral nerves divergent at a right angle from the costa ---------- **2. B. angustifolia** (H. B. K.) Kuntze.
  Leaflets mostly elliptic or ovate, the lateral nerves ascending.
    Upper teeth of calyx equaling or longer than the tube; leaves not blackening when dried; bractlets about as long as the calyx; pods 5 to 7 mm. wide. **3. B. pubescens** (Benth.) Kuntze.
    Upper teeth of calyx much shorter than the tube; leaves turning black when dried; bractlets twice as long as the calyx; pods about 10 mm. wide. **4. B. plumieri** (Turp.) Kuntze.

The later generic name *Centrosema* is often used for the genus. Two other species are known from Panama. The plants are climbing herbs or sometimes suffrutescent, with large showy axillary flowers. The pod is linear, with a long slender tip.

B. sagittata is rather scarce locally. In Salvador it is called "choncho." *B. angustifolia*, common in grassland on the Pacific slope, is a delicate vine with handsome bright purple flowers 3 cm. long. The name "buenas tardes" is said to be given to it. *B. pubescens* is very common. Its purple flowers are about 3 cm. long. The local names are "campanilla" and "caracucha," and on Taboga the name "floripondio" is said to be used. In Salvador the name is "choncho." *B. plumieri*, an occasional vine with purple flowers often 5 cm. long, also is called "choncho" in Salvador, and in Campeche "mariposa."

26. TERAMNUS Swartz

Teramnus uncinatus (L.) Swartz is a common weedy vine. The stems are herbaceous, the 3 leaflets oblong or lanceolate, silky-pubescent, the small purplish flowers in long interrupted racemes. The linear flat hairy pods are 4 to 7 cm. long and 3 to 4 mm. wide.

27. CANAVALIA H. B. K.

Valves of the pod each with 2 longitudinal ridges remote from the margin. Plants scandent; flowers dull red................1. **C. bicarinata** Standl.
Valves each with one ridge close to the margin.
  Plants scandent; leaflets often acute or acuminate; valves of the pod not separating easily into 2 layers; flowers white or pinkish. 2. **C. panamensis** Piper.
  Plants prostrate, growing on sea beaches; leaflets usually rounded or notched at apex; valves of the pod readily separating into 2 layers; flowers rose-purple................................3. **C. maritima** (Aubl.) Thou.

The Canavalias are large herbaceous vines, or sometimes suffrutescent. The leaves are pinnately 3-foliolate, the showy flowers in axillary stalked racemes. The pods are linear or oblong, flat or slightly swollen.

C. bicarinata is rather frequent on the Pacific slope. The name "flor de chicheme" is given to it on Taboga. *C. panamensis* is very common on the Pacific watershed, and *C. maritima* is frequent on beaches.

28. DIOCLEA H. B. K.

Leaflets densely pubescent beneath; pods linear, about 1.5 cm. wide. 1. **C. guianensis** Benth.
Leaflets glabrate beneath; pods oblong to orbicular, 5 cm. wide or broader.
  Bracts of the raceme erect; pod about as broad as long..2. **C. violacea** Mart.
  Bracts reflexed; pods much longer than broad............3. **C. reflexa** Hook.

The plants are large woody vines with pinnately 3-foliolate leaves and long racemes of showy purple flowers.

C. guianensis is very common in thickets. It is called "haba de monte." *C. violacea* was reported from Empire by Hemsley. *C. reflexa* is occasional in wooded swamps near the Atlantic coast.

29. CALOPOGONIUM Desv.

Pods 5 to 8 mm. wide, finely velvety-pubescent; racemes longer than the leaves, many-flowered; a large vine....................1. **C. coeruleum** Benth.
Pods about 4 mm. wide, hirsute; racemes shorter than the leaves, few-flowered; plants small, often prostrate................2. **C. brachycarpum** Benth.

The leaves have 3 broad leaflets, and the flowers are bright purple or violet; the pods are linear and compressed. Both species are common. *C. coeruleum* is known in Salvador as "bejuco de lavar," the stems being used by laundresses for rubbing clothes, to take out the dirt.

30. GALACTIA P. Br.

Galactia striata (Jacq.) Urban is a common herbaceous vine. The leaves have 3 ovate or elliptic, obtuse or acute, pubescent leaflets, and the small purple flowers are borne on slender few-flowered axillary peduncles. The flat pods are slightly curved, pubescent, 3 to 7 cm. long and 6 to 9 mm. wide. The name "frijolillo" is given here to the plant.

31. PHASEOLUS L. Bean

Pods broadly falcate, few-seeded, glabrate, usually 1.5 to 2 cm. wide. Plants scandent........1. **P. lunatus** L.
Pods linear, usually many-seeded and less than 1 cm. wide.
  Leaflets hastate-lobate, densely pilose on both surfaces. Corolla bright yellow, 2.5 cm. long; pods densely hirsute........2. **P. hirsutus** Mart.
  Leaflets entire.
    Calyx tubular, the 5 teeth all acute. Pods 3 mm. wide or less.
      Plants usually erect or decumbent; leaflets glabrous on the upper surface; corolla black-purple........3. **P. lathyroides** L.
      Plants twining; leaflets pubescent on the upper surface; corolla greenish purple or salmon........4. **P. longepedunculatus** Mart.
    Calyx campanulate, 4-lobed, the upper lobe broad, truncate or emarginate.
      Corolla about 2.5 cm. long. Stems twining; native species.
        5. **P. adenanthus** Meyer.
      Corolla usually 1.5 cm. long or often much shorter.
        Pods 3 mm. wide; native species. Stems twining.
          6. **P. peduncularis** H. B. K.
        Pods 5 mm. wide or broader; cultivated or introduced species.
          Seeds about 4 mm. long; pods about 5 mm. wide; erect annual.
            7. **P. aureus** Roxb.
          Seeds usually over 7 mm. long; pods usually 1 cm. wide; stems erect or twining........8. **P. vulgaris** L.

Other species occur in Panama. The plants are herbs with pinnately 3-foliolate leaves, the flowers in axillary racemes.

P. lunatus is the lima bean, with broad compressed seeds, which is widely cultivated in America. It is planted here and is also found wild. The local names are "habas" and "quimbolites." In Salvador forms are known as "chilipucas" and "frijol iztagapa." The wild form with small seeds is known in Central America as "frijolillo." The climbing form is the one commonly planted in the region.

P. hirsutus is rare here, but *P. lathyroides* is a common weed. *P. longepedunculatus*, common on the Pacific slope, is called "frijolillo." *P. adenanthus*, which also is frequent, has rather showy, cream and purple flowers. In Salvador it is known as "frijol" and "choncho." *P. peduncularis* is a common vine with purplish flowers. *P. aureus* is the Mung bean, cultivated in the Old World, especially in China for bean sprouts and gelatin. It was collected by Pittier as a waif at Mamei Hill in 1911, and is probably cultivated about the zone by the Chinese gardeners.

P. vulgaris is the common bean or "frijol" to which most of the cultivated beans belong. It is next to corn the most important food staple of Central America, but about the zone the black beans, "frijoles negros," the common beans of Central America and Mexico, are little used. Dry beans of several varieties, as well as string beans, are common in the markets.

32. DOLICHOS L.

Dolichos lablab L., the hyacinth-bean, is cultivated for its edible seeds and for ornament, and is naturalized locally about the zone. It is a large herbaceous vine, the leaves with 3 large broad leaflets, the showy, white or purple flowers in long-stalked racemes. The pods are flat, about 7.5 cm. long and 2.5 cm. wide, containing a few black seeds. In Porto Rico the names "chicharros" and "frijol caballero" are used; in Mexico "gallinita"; in Salvador "frijol de adorno."

33. PACHYRHIZUS Rich.

Pachyrhizus erosus (L.) Urban is occasional about the zone. It is a large herbaceous vine, the 3 leaflets shallowly lobed or angled, silky-hairy beneath; the purple flowers are borne in long axillary racemes. Specimens collected in Mount Hope Cemetery may belong rather to *P. palmatilobus* (Moc. & Sessé) Benth., in which the leaflets are deeply lobed. Under the name of "jícama" these plants are much grown in Mexico and some parts of Central America for their large turnip-like roots. These are eaten raw, being juicy and of agreeable flavor. About the zone the name "guavita cansa-boca" is sometimes given to *P. erosus*.

34. VIGNA Savi

Stipules with auricles at base; pods 10 to 40 cm. long; cultivated species.
1. V. unguiculata (L.) Walp.

Stipules not auricled; pods 4 to 10 cm. long; native species.
  Stems usually glabrous or glabrate; corolla usually 1.5 cm. long or shorter; flowers numerous in the raceme..............**2. V. repens** (L.) Kuntze.
  Stems copiously pilose; corolla 2 to 2.5 cm. long; flowers usually 4 or fewer in the raceme..........................**3. V. vexillata** (L.) A. Rich.

The Vignas are herbs with pinnately 3-foliolate leaves and long-peduncled racemes; the pods are linear and nearly terete.

V. unguiculata is the cowpea, a native of tropical Africa. It is planted here as elsewhere in Central America for the seeds, which in some localities are an important article of food. In *V. repens*, which is common on the Atlantic slope, especially near the beaches, the corolla is yellow. In *V. vexillata*, which also is common and more widely distributed here, the corolla is pale yellow, tinged with purple. In Salvador the name "choncho" is given to the latter plant.

35. ANDIRA Lam. CABBAGEBARK

Andira inermis H. B. K. (pl. 38) is a common forest tree, often attaining a large size. The alternate leaves have 7 to 13 opposite oblong acuminate glabrous leaflets. The purple flowers (1 to 1.5 cm. long) are borne in terminal panicles. The fruit is subglobose, woody, 2 to 4 cm. in diameter, containing a single seed. The bark has a disagreeable odor and is used as a vermifuge, purgative, and narcotic, but in large doses is a dangerous poison, and the seeds are said to contain a poisonous alkaloid. The wood is hard, heavy, strong, and durable, and takes a high polish. It varies in color from yellowish to nearly black. In Panama the tree is called "cocú"; in Salvador "almendro," "almendro montés," "almendro macho," "almendro real"; in Mexico "moca colorada," "pacay," "macayo"; in Porto Rico "moca."

36. COUMAROUNA Aubl.

Coumarouna panamensis Pittier (pl. 39), common in the forests, is a large tree, often reaching a height of 50 meters and a trunk diameter of a meter. The pinnate leaves have 5 to 8 pairs of leaflets, these oblong-elliptic, with the costa closer to the lower margin. The pink flowers are borne in terminal panicles; the pod is ellipsoid, 6 cm. long and 3.5 cm. wide, and 1-seeded. The fresh fruits are filled with an oily sweet-scented liquid which crystallizes when dry. The species is endemic in Panama, where the vernacular name is "almendro." The seeds are roasted and the kernels eaten. The wood is very hard.

Another member of the genus is *C. odorata* of South America, the cumarú or tonka-bean, whose seeds contain a principle, cumarin, used in the manufacture of perfume.

37. **MUELLERA** L. f.

Muellera moniliformis L. f. was reported from our region by Hemsley. It is a tree, the leaves with 5 or 7 elliptic acute glabrous leaflets. The flowers are purplish and racemose, about 1.5 cm. long. The pods are many-seeded, nearly terete, and deeply constricted between the seeds.

38. **PLATYMISCIUM** Vog.

Platymiscium polystachyum Benth. occurs in the forests and is planted in Ancón. It is a large tree with opposite pinnate leaves, the few leaflets large, abruptly acuminate, and glabrous. The small yellow flowers are borne in racemes on old wood; the pods are oblong, 3 cm. wide, and one-seeded. The red or reddish brown, rather fine-grained, hard, and heavy wood is used in the United States for cabinet work, for billiard cue butts, and as a substitute for cocobola in making knife handles. Some of the heavy timbers in the National Palace in Panama are said to be of this wood. The Panama name is "quira," and in commerce the lumber is usually called "Panama redwood." In Venezuela the tree is called "roble," "roble colorado," and "roble blanco."

39. **LONCHOCARPUS** H. B. K.

Leaflets velvety-pubescent beneath. Fruit not thickened along the upper margin .... 1. **L. velutinus** Benth.
Leaflets glabrous beneath or with pubescence of appressed hairs.
  Fruit thickened on the upper margin opposite the seeds; leaflets glabrous or nearly so beneath .... 2. **L. lucidus** Pittier.
  Fruit with thin margins; leaflets densely appressed-pubescent beneath. 3. **L. latifolius** H. B. K.

Other species occur in Panama. The plants are trees of small or medium size, with odd-pinnate leaves having large opposite leaflets. The showy purple flowers are borne in long racemes; the fruit is a flat, oblong or linear, indehiscent pod.

L. velutinus was first collected at Culebra. In Chiriquí it is called "gallote." *L. lucidus* has been found in the Gatún Valley and *L. latifolius* near the Atlantic coast. *L. lucidus* is known at Chepo as "malvecino." *L. latifolius* is called "dogwood" in the Changuinola Valley and "palo hediondo" in Porto Rico.

40. **DREPANOCARPUS** Meyer

Drepanocarpus lunatus (L. f.) Meyer is an erect or scandent, spiny shrub, occurring on the Atlantic coast. The leaves are odd-pinnate, the leaflets oblong or obovate, 2 to 5 cm. long, finely nerved, and glabrous. The panicled flowers are purple. The pods are flat and curved into a circle. In Porto Rico the plant is called "escambrón" and "palo de hoz."

41. DALBERGIA L. f.

Leaves with about 9 leaflets.........................**1. D. retusa** Hemsl.
Leaves with a single leaflet.
  Leaflets glabrous beneath; fruit 1 to 3-seeded.
    2. D. brownii (Jacq.) Urban.
  Leaflets short-sericeous beneath; fruit 1-seeded.
    3. D. ecastophyllum (L.) Taub.

The name *Amerimnon* is sometimes used for the genus. The plants are shrubs or trees, with whitish flowers in axillary clusters. The flat fruit is either short or elongate.

D. retusa is an occasional tree in forests about the zone, and is plentiful in some parts of Panama. The vernacular name is "cocobola" or "cocobolo." This and closely related species furnish the cocobola wood of commerce, which is used extensively in the manufacture of knife handles and of many other articles. The wood is usually dark red with black or dark purple markings, hard, heavy, and fine-grained. It is one of the rosewoods of commerce.

D. brownii, frequent in coastal thickets and in swamps near the coasts, is a shrub or small tree with ovate leaflets. *D. ecastophylium* is a shrub frequenting the beaches of the Atlantic coast.

42. PTEROCARPUS L. Bloodwood

Leaflets 5 to 9, acuminate; fruit 3 to 5 cm. broad....**1. P. officinalis** Jacq.
Leaflets 9 to 13, obtuse; fruit 6.5 to 7.5 cm. broad......**2. P. hayesii** Hemsl.

The plants are unarmed trees with alternate odd-pinnate leaves, the yellowish flowers in terminal or axillary racemes or panicles. The fruit is 1 or 2-seeded, surrounded on all sides by a broad thin wing.

P. officinalis (*P. draco* L.), a large tree, is frequent on the Atlantic slope. Its bark when cut exudes a blood-red sap which solidifies and forms a red resin. This was used formerly in medicine under the name of "dragon's-blood," and was at one time exported to Spain in large quantities from Colombia. The wood is white or whitish, rather fine-grained, but not durable. The names "sangre de drago" and "sangregado" are reported from Guatemala and Nicaragua, and in Porto Rico the tree is called "palo de pollo." *P. hayesii* is an endemic and little-known species.

43. PLATYPODIUM Vog.

The only Central American species, *P. maxonianum* Pittier, is occasional in the forests. It is a tree of 15 to 25 meters, the leaflets oblong, about 6 cm. long, and nearly glabrous. The fruit is samaralike, 1-seeded, swollen over the seed, and decurrent below into a broad thin wing, the whole fruit being about 11 cm. long. The sapwood is light greenish yellow, moderately hard and heavy, rather fine-grained, and tough. In Chiriquí the tree is called "carcuera" and in Colombia "lomo de caimán."

44. MACHAERIUM Pers.

Leaflets rounded at apex, oblong, 10 to many pairs.
  Leaflets usually 10 to 12 pairs, mostly 1.5 to 4.5 cm. long, pilose beneath.
    1. M. purpurascens Pittier.
  Leaflets 20 or more pairs, mostly 8 to 12 mm. long, glabrous.
    2. M. microphyllum (Meyer) Standl.
Leaflets acuminate, usually about 5 pairs.
  Panicles shorter than the leaves; leaflets ciliate, ovate or lanceolate, 1.5 to 3 cm. wide.................................**3. M. seemanni** Benth.
  Panicles longer than the leaves; leaflets not ciliate, oblong or elliptic-oblong, mostly 4 to 6 cm. wide.................**4. M. marginatum** Standl.

Other species are found in Panama. The plants are mostly scandent shrubs, usually armed with stout stipular spines, the leaves odd-pinnate. The small purple flowers are racemose or paniculate; the fruit is samaralike, compressed, 1-seeded, with a broad terminal wing.

M. purpurascens is a common large vine. *M. microphyllum* (*M. glabripes* Pittier) also is common, and is scandent or sometimes erect. *M. seemanni* is abundant and *M. marginatum* not infrequent. The last is more commonly an erect shrub. In Salvador it is known as "sangre bravo," and in Oaxaca as "uña de gato."

66. OXALIDACEAE. Oxalis Family

1. OXALIS L.

Leaves digitately 3-foliolate; leaflets obcordate; plants creeping
1. O. corniculata L.
Leaves pinnately 3-foliolate; leaflets ovate; plants erect..**2. O. sepium St. Hil.**

At least one other species is known from Panama. The plants are herbs with long-stalked leaves and small yellow flowers having 5 sepals, 5 petals, and 10 stamens; the fruit is a columnar 5-celled capsule. *O. corniculata* has been found here only as a weed in a garden in Balboa, and is doubtless introduced. *O. sepium* is a rare native plant.

67. ERYTHROXYLACEAE. Coca Family

1. ERYTHROXYLON L.

Leaves rounded at apex........................**1. E. mexicanum H. B. K.**
Leaves acute.
  Leaves mostly 2 to 3 cm. wide; stipules small and inconspicuous, not conspicuously nerved........................**2. E. panamense Turcz.**
  Leaves mostly 5 to 8 cm. wide; stipules usually longer than the petioles, conspicuously nerved........................**3. E. amplum Benth.**

The plants are glabrous shrubs or small trees with alternate entire short-petioled leaves. The small flowers, clustered in the leaf axils, have a 5-lobed calyx, 5 petals, and 10 stamens; the fruit is a usually 1-celled drupe.

E. mexicanum is frequent on the Pacific slope, especially in thickets along the shore. *E. panamense* is an endemic species of the Atlantic forests. *E. amplum* occurs in swamps of the Atlantic slope.

E. coca Lam., of South America, the coca plant, from whose leaves cocaine is obtained, is cultivated extensively in Peru and Bolivia. It seems not improbable that the Central American species may have the same properties.

68. ZYGOPHYLLACEAE. Caltrop Family

Plants herbaceous, prostrate; flowers yellow; fruit of 8 to 12 1-seeded nutlets.
1. KALLSTROEMIA.
Plants trees; flowers blue or purple; fruit coriaceous, with 2 to 5 winglike angles.
2. GUAIACUM.

1. KALLSTROEMIA Scop.

Kallstroemia maxima (L.) Torr. & Gray is a weedy plant, of infrequent occurrence about the zone, although common in many parts of Central America. The leaves have 6 or 8 small oblong leaflets. In Salvador it is called "verdolaga blanca," "hierba de pollo," and "verdolaguita," and the young plants are sometimes cooked and eaten as a pot herb.

2. GUAIACUM L. LIGNUMVITAE

Petals tomentulose; leaflets usually 4................1. **G. officinale** L.
Petals glabrous; leaflets usually 6 to 10..................2. **G. sanctum** L.

The plants are small trees with opposite leaves having sessile obovate leaflets 1 to 5 cm. long. The showy flowers, clustered in the leaf axils, have 4 or 5 petals and 8 or 10 stamens.

G. officinale is planted in Santa Ana Park in Panama, and probably elsewhere. Small plants of *G. sanctum* are planted in Balboa. Both species are natives of the West Indies. Their wood is olive-brown to nearly black, oily or waxy, with a distinctive odor, very hard, heavy, and fine-grained. It is used for bearings of the stern tubes of propeller shafts of steamships, for mallets, bowling balls, and many other objects in which great strength and tenacity are necessary. The resin is used to some extent in medicine. In early days (about 1508) the wood attained great fame in Europe as a remedy for syphilitic affections and brought extravagant prices. It was in general use for two centuries before its value was questioned, but it is now believed to have no pronounced effect in such diseases. The Spanish name for plants of this genus is "guayacán."

69. RUTACEAE. Rue Family

Fruit dry, of 1 to 5 follicles; stamens as many as the petals. Trees or shrubs, armed with prickles; leaves with numerous acute or acuminate leaflets. 1. **ZANTHOXYLUM.**
Fruit a berry; stamens twice as many as the petals or more numerous.
  Stamens 8 or 10; fruit small (1 to 1.5 cm. long), red; leaflets 3 to 9, obtuse; plants unarmed.......................................2. **CHALCAS.**
  Stamens numerous; fruit large, yellow; leaflet 1; plants armed with spines. 3. **CITRUS.**

Our representatives of the family are aromatic trees or shrubs, their compound leaves dotted with pellucid glands. The flowers have 4 or 5 sepals and as many petals.

1. ZANTHOXYLUM L. PRICKLY-ASH

Plants with fine stellate pubescence on branchlets and petioles. 1. **Z. microcarpum** Griseb.
Plants glabrous or with pubescence of simple hairs.
  Leaflets glabrous or nearly so..................2. **Z. panamense** P. Wilson.
  Leaflets copiously pubescent beneath..........3. **Z. setulosum** P. Wilson.

Other species occur in Panama. The plants are trees, often reaching a large size, the leaf rachises usually prickly, and the trunks armed with short conelike spines. The small greenish flowers are inconspicuous.

Z. microcarpum has been collected near Matías Hernández. In Salvador it is called "cedro espino" and "pochote." *Z. panamense* and *Z. setulosum* are endemic species, both common. They are called "arcabú," "acabú," and "alcabú." The spines of the trunk are easily detached, with a flat basal surface. The wood of which they are composed is fine-grained, and a design is sometimes cut on the base and the spine used to stamp figures on cloth or paper.

2. CHALCAS L. ORANGE-JASMINE

Chalcas exotica (L.) Millsp. (*Murraya exotica* L.), native of the East Indies, is planted for ornament and is naturalized about old settlements. It is a shrub or small tree with dark green leaves and small white flowers. In Central America it is known as "mirto" (the name employed in Panama), "jazmín de Arabia," and "limonaria."

3. CITRUS L.

Fruit ellipsoid, mamillate at apex, small (usually 5 cm. long or less), pale yellow. **1. C. aurantifolia** (Christm.) Swingle.

Fruit globose, not mamillate, larger, orange-colored.

Petiole very narrowly winged; fruit sweet, with a solid core. **2. C. sinensis** (L). Obseck.

Petiole broadly winged; fruit very sour, with a hollow core. **3. C. aurantium** L.

Citrus aurantifolia, the lime, native of Asia, is frequently planted and occurs wild in many places. No doubt it was introduced at an early date. The lime is called in Central America "limón," the Spanish name, "lima," not being in use. The lemon, to which the name "limón" properly belongs, is called "limón real," but it is rarely planted, its place being taken by the lime, which is common everywhere. The sweet lime or "lima dulce" (*Citrus limetta* Risso) is common in many parts of Central America. It has a subglobose fruit, much larger than a lime, of sweet, rather insipid flavor.

C. sinensis, the sweet orange or "naranja," is planted about houses, but is not grown here upon a commercial scale. *C. aurantium,* the sour orange ("naranja ácida" or "naranja agria") is occasionally found wild about the zone. The fruits are too sour to be eaten.

The grapefruit ("toronja"), *C. grandis* (L.) Osbeck, is little planted in Central America, and is not liked by the native people because of its sourness. *C. medica,* the citron, "toronja" or "cidra," a fruit much resembling the grapefruit in size and appearance, is often planted, the thick rind being used to prepare a delicious confection.

70. SIMAROUBACEAE. Simaruba Family

Carpels of the fruit 1-ovulate; petiole and rachis broadly winged; leaflets opposite; flowers bright red, 3 cm. long........................ **1. QUASSIA.**

Carpels of the fruit 2-ovulate; petiole and rachis not winged; leaflets alternate; flowers whitish, minute........................ **2. PICRAMNIA.**

The plants are shrubs or small trees with alternate pinnate leaves having entire leaflets; the stamens are twice as many as the petals; the fruit consists of 2 to 5 carpels. The genus *Simarouba* is represented in Panama.

1. QUASSIA L. Quassia

The only Central American species, *Q. amara* L., is common in forests of the Atlantic slope. It is a slender shrub or small tree, when in blossom very showy because of the large racemes of brilliant flowers. All parts of the plant are as bitter as quinine, this flavor resulting from a principle, quasin, which was formerly believed to be of value as a febrifuge. At present an infusion of the wood in alcohol is used in parts of Panama as a remedy for fevers. The plant furnishes the bitterwood or quassia of commerce, which is employed in the manufacture of insecticides, as a substitute for hops in ale and beer, and in the preparation of proprietary medicines and "conditioning powders" for domestic animals. In Panama the plant is called "crucete," "guavito amargo," "puesilde," and "guavito"; in Chiriquí "guavo"; in Costa Rica "hombre grande." It is said to be used in Panama as a remedy for snake bites.

2. PICRAMNIA Swartz

Picramnia latifolia Tulasne is a small slender tree, occasional in the forests. The leaves have 5 or 7 large elliptic-ovate leaflets; the flowers are borne in long slender pendent spikes.

71. BURSERACEAE. Torchwood Family

Petals imbricate in bud, distinct; fruit dry, dehiscent, 3-angled, about 1 cm. long.
  Leaflets ovate or oblong-elliptic, caudate-acuminate......1. **ELAPHRIUM.**
Petals valvate in bud; fruit drupaceous.
  Petals united. Leaflets lance-oblong; fruit 3-lobed, about 2 cm. in diameter. 2. **TETRAGASTRIS.**
  Petals distinct..3. **PROTIUM.**

The plants are trees, aromatic and producing resin, with alternate, pinnate, usually deciduous leaves. The small inconspicuous panicled flowers have 3 to 5 petals and twice as many stamens. The ovary is 3 to 5-celled, with 2 ovules in each cell.

1. ELAPHRIUM Jacq. GUMBOLIMBO

Elaphrium simaruba (L.) Rose (*Bursera simaruba* Sarg.; pl. 40) is a common tree of the region. It is usually 5 to 10 meters high, and is easily recognized by the smooth, green or brown bark peeling off in thin papery sheets. The sap has a characteristic aromatic odor. The gum which exudes from the trunk is employed as cement for mending broken dishes, and was utilized by the Caribs for coating their canoes, in order to protect them from worms. The tree is used more or less in domestic medicine. It is one of the trees most planted in Central America for living fence posts. About the zone it is called "almácigo" and "carate"; in Costa Rica "jiñocuave," "caraña," and "jiñote"; in Salvador "jiote"; in Mexico "mulato"; and there are many other names in use. In Florida and Jamaica the tree is called "gumbolimbo," a corruption of the Spanish "goma elemí." The whitish or light brown, light in weight, and soft wood is little used in Central America except for fuel, but in Haiti it has been employed successfully for making soap boxes.

Some of the Mexican species furnish copal gum of commerce, which is employed in the manufacture of varnish and as incense.

2. TETRAGASTRIS Gaertn.

The only Central American species, *T. panamensis* (Engler) Kuntze, is endemic in Panama. It is a forest tree 10 meters high or larger.

3. PROTIUM Burm.

Leaves scabrous, very rough..........................1. **P. asperum** Standl.
Leaves not scabrous, smooth.
  Flowers sessile..........................2. **P. sessiliflorum** (Rose) Standl.
  Flowers pedicellate................3. **P. panamense** (Rose) I. M. Johnston.

Other species have been found in Panama. The plants are trees, their leaves with few large long-stalked leaflets. *P. asperum*, called "caraño," has been collected only on Barro Colorado Island, but doubtless occurs elsewhere. It is a large tree, from the trunk of which exude large amounts of a liquid resin of a peculiar strong agreeable odor. This resin or balsam is said to be collected for market. *P. sessiliflorum* has been collected at Alhajuela, and *P. panamense* at Gatún. The latter is known at Nombre de Dios as "copá," doubtless a corruption of the Aztec "copal." *P. sessiliflorum*, called "anime," has smooth pale bark.

72. MELIACEAE. Chinaberry Family

Leaves bipinnate, the leaflets toothed; fruit a drupe. Introduced tree. **1. MELIA.**

Leaves once pinnate, sometimes with only one leaflet, the leaflets entire; fruit a capsule. Native trees or shrubs.
  Filaments free. Fruit about 3 cm. long; seeds winged-------**2. CEDRELA.**
  Filaments united at least to the middle.
    Anthers borne on the apex of the stamen tube or of its lobes. Capsule about 1 cm. long; seeds not winged; leaflets 1 or numerous--**3. TRICHILIA.**
    Anthers borne inside the apex of the stamen tube; leaflets numerous.
      Ovules 1 or 2 in each cell; seeds not winged; fruit usually about 3 cm. in diameter--**4. GUAREA.**
      Ovules 12 in each cell; seeds winged; fruit about 15 cm. long. **5. SWIETENIA.**

The Meliaceae are trees or shrubs, the leaves compound, alternate, without stipules. The perfect regular flowers have a 4 or 5-lobed calyx, 4 or 5 petals, and 5, 8, or 10 stamens.

1. MELIA L. CHINABERRY

Melia azedarach L., the chinaberry, china-tree, or umbrella-tree, native of southeastern Asia, is planted for ornament. It is a small tree with low dense crown and panicles of handsome sweet-scented purplish flowers which somewhat suggest lilacs. The fruit is a translucent 4-seeded drupe. This tree is commonly planted in the southern United States. The wood is soft and weak and the branches easily broken. The fruit is generally reputed poisonous to human beings, and the bark is reported to be used in some regions for stupefying fish. About the zone the tree is called "jacinto"; elsewhere in Central America and in Mexico it is called "paraíso" and "lila."

2. CEDRELA L. SPANISH-CEDAR

Leaflets glabrous or nearly so-----------------------**1. C. mexicana** Roem.
Leaflets densely pubescent beneath---------------------**2. C. fissilis** Vell.

The Cedrelas are large or medium-sized trees, the deciduous even-pinnate leaves with several pairs of large, oblong, acute or acuminate leaflets. The small greenish flowers are panicled; the oval capsules open to the base by 5 valves.

C. mexicana, the "cedro amargo," has been planted about the zone as a shade tree and probably occurs wild, since it is known from near-by regions. *C. fissilis* is common, at least on the Pacific slope. Cedrela trees are known everywhere in Central America by the name "cedro." *C. fissilis* is called "cedro macho" in Salvador and "cedro dulce" in Panama.

Spanish-cedar is a reddish wood, soft, easy to work, durable, and fragrant. In Central America it is highly esteemed because it is not attacked by insects, and it is employed for all sorts of building purposes and for furniture. Large amounts are used in the United States for cigar boxes, it being the only wood considered satisfactory for the purpose. About 10,000,000 board feet are consumed each year in the United States, but very little of this comes from Panama.

3. TRICHILIA L.

Leaves mostly with 1 leaflet; flowers clustered in the leaf axils. Capsule pilose. **1. T. unifoliola** Blake & Standl.
Leaves usually with 5 or more leaflets; flowers in elongate panicles.
  Filaments united into a tube. Leaflets 5 or 7. **2. T. tuberculata** (Triana & Planch.) C. DC.

Filaments distinct to or below the middle.
  Leaflets 7 to 9, usually over 4 cm. wide……**3. T. acutanthera** C. DC.
  Leaflets 9 to 21, usually less than 3 cm. wide……**4. T. hirta** L.

The capsule is commonly subglobose, 3-valved, and 3-seeded, the seeds surrounded by a fleshy, usually red aril. *T. unifoliola*, an endemic species, is a common shrub or small tree in thickets near the Pacific coast. *T. tuberculata* also is endemic. At Chepo it is called "alfaje." *T. acutanthera* has been found near Chepo. *T. hirta* is a small tree, occasional on the Pacific watershed. This species is known in Salvador as "cedrillo," "jocotillo," and "cola de pavo"; in Nicaragua as "mata piojo"; in Mexico as "garbancillo" and "cabo de hacha."

4. **GUAREA** Allem.

The only species known from this area is *G. guara* (Jacq.) P. Wilson (*G. parva* C. DC. is a synonym), which is a frequent tree of good size in the forests. The leaves have 8 to 20 opposite oblong leaflets, 10 to 20 cm. long; the capsule is globose-obovoid and usually 4-valved. The wood is hard, reddish brown, moderately heavy, strong, and durable, taking a fine finish, and is used locally for many purposes. In Panama the tree is called "cedro macho."

5. **SWIETENIA** Jacq. MAHOGANY

Swietenia macrophylla King, the only mahogany known from Panama, is reported as occurring sparingly along the upper Chagres and in the valley of the Bayano River. This species is planted for shade about the zone. It is a large tree, the leaves with 8 to 12 lanceolate unequal acuminate leaflets, the small whitish flowers in axillary panicles. The capsule is ovoid and pointed, containing numerous broadly winged seeds. The current name for mahogany over most of its range is "caoba."

Five species of mahogany are known: This, which ranges from southern Mexico to Colombia, and perhaps into Ecuador; *S. mahagoni* (L.) Jacq., of the West Indies and southern Florida; *S. humilis* Zucc., ranging from western Mexico to Salvador; *S. cirrhata* Blake, of the same region; and *S. candollei* Pittier, of Venezuela. All species furnish commercial mahogany, little of which has been exported from Panama.

The wood is the one most highly esteemed for cabinet work, and is a standard for the comparison of other woods. In Central America it is valued for construction purposes.

73. MALPIGHIACEAE. Malpighia Family

Fruit a drupe; plants never scandent.
  Styles with subulate tips; leaves usually densely tomentose beneath. Petals yellow……**1. BYRSONIMA.**
  Styles with thick tips; leaves not tomentose.
    Styles distinct; flowers pink or pale red, in small cymes……**2. MALPIGHIA.**
    Styles united; flowers yellow, in elongate racemes or panicles. **3. BUNCHOSIA.**
Fruit of 1 to 3 samaras; plants nearly always scandent. Flowers yellow.
  Samaras with lateral wings.
    Wings of the fruit with 2 long narrow lobes……**4. TETRAPTERIS.**
    Wings not lobed……**5. HIRAEA.**
  Samaras each with a single dorsal wing (this much reduced in *Brachypterys*).
    Stigma clavate or truncate. Leaves densely silvery-silky beneath; wing of the fruit thickened on inner side……**6. BANISTERIOPSIS.**

Stigma borne on the ventral edge of the dilated style tip.
  Wing of the samara much reduced, crestlike. Perfect stamens 10. **7. BRACHYPTERYS.**
  Wing of the samara large, obovate.
    Perfect stamens 10; samara wings thickened on the outer edge. **8. BANISTERIA**
    Perfect stamens 4; samara wings thickened on the inner edge. **9. STIGMAPHYLLON.**

All our species are woody plants with usually opposite, entire or somewhat lobed leaves, which often bear glands on the petiole or on the lower surface of the blade. The pubescence is usually characteristic, consisting of glistening, closely appressed hairs attached by the middle. The 5 sepals nearly always bear glands on their outer surface. The 5 petals are commonly clawed and toothed.

1. BYRSONIMA Rich. NANCE

Byrsonima crassifolia (L.) H. B. K., common in fields and on brushy hillsides, is a large shrub or small tree, sometimes 10 meters high. The leaves are oblong to rounded-obovate, very variable in outline, densely grayish or reddish-tomentose beneath; the yellow flowers (turning reddish as they fade) are borne in terminal racemes. The fruit is a globose yellow drupe about 1 cm. in diameter, edible, with a flavor suggestive of an apple. It is not very highly esteemed in Central America and is eaten mostly by children, although occasionally it is offered in the markets. A fermented beverage known as "chica" (chicha?) is said to be made from the fruits in Panama. The wood is dull reddish or pinkish brown, rather hard and heavy, strong, and brittle. It is burned for charcoal and used to a small extent for construction purposes.

This is one of the most common trees along the Pacific slope of Central America at low altitudes, often forming extensive groves of distinctive appearance, and frequently associated with guavas. The current name throughout Central America is "nance," or in Mexico "nanche," an Aztec term. The name "nancite" is used in Costa Rica and Salvador, and in Colombia the tree is said to be known as "yuco," "chaparro," and "peralejo." In the British West Indies the tree is called "golden-spoon."

Several other species of *Byrsonima* have been reported from Panama, but if there are any definite characters by which they can be distinguished from *B. crassifolia*, they are yet to be discovered.

2. MALPIGHIA L.

Malpighia punicifolia L. is rare on the Pacific slope and perhaps introduced from the West Indies. It is a shrub or tree of 4 to 6 meters with obovate obtuse glabrous leaves and sessile cymes of pale red flowers. The fruit, a globose red drupe 1 to 1.5 cm. in diameter, is sour and edible, being eaten raw or made into preserves or "dulces." The local name is "grosella," and in Cuba the fruit is called "cereza."

Another species, *M. glabra* L., with acute leaves, occurs elsewhere in Panama.

3. BUNCHOSIA Rich.

Pubescence of the branches and leaves loose and spreading_**1. B. pilosa** H. B. K.
Pubescence closely appressed______________________**2. B. cornifolia** H. B. K.

The Bunchosias are erect shrubs or small trees with short-petioled leaves, and yellow flowers in axillary racemes or small panicles; the fruit is an orange or red drupe, subglobose and 2 or 3-lobed.

B. pilosa is frequent on the Pacific slope. Its leaves are oval or rounded and usually 8 to 10 cm. wide. *B. cornifolia*, a more generally distributed species, has narrower leaves. At Chepo it is known as "cerezo" and "cerezo de monte."

4. TETRAPTERIS Cav.

Upper wings of the fruit 4 to 5 cm. long, sericeous, distinct from the lower ones. 1. **T. glabrifolia** (Griseb.) Small.
Upper wings 3 to 3.5 cm. long, glabrous, confluent with the lower ones. 2. **T. seemanni** Triana & Planch.

The plants are woody vines with glabrous leaves and showy yellow flowers. *T. glabrifolia* has been collected near France Field. *T. seemanni* is an endemic species, frequent about the zone.

5. HIRAEA Jacq.

Leaves densely sericeous beneath; wings of the fruit leathery. Leaves acuminate. 1. **H. fagifolia** (Swartz) Niedenzu.
Leaves at maturity glabrous or nearly so; wings of the fruit membranous.
  Leaves acuminate; anthers oblong---------------2. **H. fagifolia** (DC.) Juss.
  Leaves mostly rounded at apex; anthers subglobose-3. **H. obovata** Niedenzu.

The plants are usually scandent shrubs. The petioles bear glandlike stipules; the yellow flowers are large and showy; the fruit consists of 3 samaras with large broad lateral wings.

H. faginea is frequent on the Atlantic slope. *H. fagifolia* has been collected at Fort Randolph and *H. obovata* at Alhajuela.

6. BANISTERIOPSIS C. B. Rob.

Calyx bearing 8 glands-------------1. **B. argentea** (H. B. K.) C. B. Rob.
Calyx without glands------------2. **B. schomburgkiana** (Benth.) C. B. Rob.

The species are woody vines with large showy yellow flowers. The leaves are broadly ovate and densely silvery-silky beneath; the fruit consists of 2 or 3 large samaras, their wings thickened along the inner side. Both species are of frequent occurrence on the Pacific slope. *B. argentea* is known as "ala de zompopo" in Salvador (zompopo is the local name for the large leaf-cutting ants that do so much damage to cultivated plants).

7. BRACHYPTERYS Juss.

Brachypterys ovata (Cav.) Small, occasional in swamps near the Atlantic coast, is a woody vine with oblong or ovate leaves, minutely sericeous beneath, and showy yellow flowers. The samaras are hard and bonelike, with very short, beaklike wings.

8. BANISTERIA L.

Leaves densely sericeous beneath; inflorescence with closely appressed, brown hairs--1. **B. kuntzei Small.**
Leaves in age glabrous or nearly so; inflorescence ferruginous-tomentose. 2. **B. laurifolia L.**

Other species occur in Panama. They are large woody vines with showy yellow flowers in panicled cymes; the fruit consists of 1 to 3 samaras whose wings are thickened on the outer margin. *B. kuntzei* is an endemic species of the Atlantic slope. *B. laurifolia* was reported from the zone by Hemsley but has not been collected here recently, although it grows elsewhere in Panama. The name "cointura" has been reported from Panama. This species is called "coral" in Costa Rica, "pinsanillo" in Mexico, and "bejuco de buey" in Porto Rico.

9. STIGMAPHYLLON Juss.

Leaves glabrous or nearly so, mostly 3 to 5 cm. wide.
1. **S. ellipticum** (H. B. K.) Juss.
Leaves sericeous or tomentose beneath, usually larger.
  Leaves with glands along the margin, sericeous or tomentose beneath.
  2. **S. humboldtianum** Juss.
  Leaves without marginal glands, very densely sericeous beneath with silvery shining hairs....................3. **S. hypargyreum** Triana & Planch.

At least one other species occurs in Panama. The plants are woody vines with showy yellow flowers. *S. ellipticum* and *S. humboldtianum* are common about the zone. The former is known in Salvador as "tripa de gallina," "chinaca," "flor de Jesús," and "bejuco de sapo"; in Guatemala as "bejuco de ratón." *S. hypargyreum* is endemic in Panama.

74. TRIGONIACEAE. Trigonia Family

1. TRIGONIA Aubl.

Trigonia floribunda Oerst., occasional in woods or thickets, is a climbing shrub with opposite short-petioled entire leaves, densely white-tomentose beneath, and small white flowers in terminal panicles. The flowers have 5 unequal petals and 10 stamens. The fruit is a 3-angled capsule.

This is probably the same species as that reported from Panama by Hemsley under the name of *T. laevis* Aubl.

75. VOCHYSIACEAE. Vochysia Family

1. VOCHYSIA Juss.

Vochysia ferruginea Mart. is an occasional forest tree, known in North America only from Panama. It is 10 to 20 meters high, with thick opposite oblong leaves, 8 to 16 cm. long, acuminate, and reddish-tomentose beneath. The yellow flowers have 3 oblong petals, one of which is spurred, and 1 fertile stamen. The fruit is a 3-angled capsule 2.5 cm. long. The panicles of flowers are very showy.

Another species, *V. hondurensis* Sprague, with glabrous leaves, occurs in the region of Bocas del Toro, where it is said to be known as "yamery." In Costa Rica it is called "palo chancho"; in Honduras, "San Juan" and "San Pedrano."

76. POLYGALACEAE. Polygala Family

Ovary 2-celled; fruit a capsule; herbs......................1. **POLYGALA.**
Ovary 1-celled; fruit a samara; woody vines..............2. **SECURIDACA.**

The genus *Monnina* is represented in the mountains of Panama. The plants of the family have entire leaves without stipules; the flowers are perfect and irregular, with 5 sepals (the 2 lateral inner ones—wings—large and colored, the others smaller), usually 3 petals which are more or less united, and normally 8 stamens.

1. POLYGALA L.

Keel petal not crested; stems branched from near the base. Leaves lanceolate or linear-lanceolate; flowers green, tinged with purple.
1. **P. bryzoides** St. Hil.
Keel crested; stems simple, or branched above the middle.
  Racemes long and slender, laxly flowered, about 5 mm. thick. Flowers rose-purple, rarely white; leaves linear.

Stems minutely puberulent..........................2. **P. paniculata** L.
Stems glabrous..........................3. **P. gracilis** H. B. K.
Racemes short and very dense, about 10 mm. thick.
Leaves mostly in whorls of 3, oval..........................4. **P. timoutou** Aubl.
Leaves alternate, linear.
Wings not cuspidate; racemes longer than thick, pointed.
5. **P. hygrophila** H. B. K.
Wings cuspidate; racemes as broad as long, not pointed
6. **P. lon gicaulis** H. B. K.

Other Polygalas occur in Panama. Ours are all annuals with racemes of small flowers. *P. bryzoides* is a rather scarce plant, and *P. paniculata* is a common weed. The other species are plants of the savannas. *P. timoutou* has been collected in the region only at El Vigía.

2. SECURIDACA L.

Leaves densely velvety-pilose beneath..........................1. **S. coriacea** Bonpl.
Leaves with sparse short appressed hairs beneath..2. **S. diversifolia** (L.) Blake.

The name *Elsota* has been used for the genus. The plants are small woody vines, sometimes erect when young, with racemes of showy pink flowers which suggest those of some leguminous plants. The samaras are 4 to 7 cm. long. *S. coriacea* (*Elsota chrysotricha* Riley) is frequent on the Pacific slope, and *S. diversifolia* is generally distributed. The latter is known in Honduras as "tamagás" and "bejuco de purgación."

77. EUPHORBIACEAE. Spurge Family

Flowers surrounded by a cup-shaped or shoe-shaped, gamophyllous involucre containing both pistillate and staminate flowers; perianth none or minute.
Involucre cuplike, regular..........................1. **EUPHORBIA.**
Involucre shoe-shaped, very irregular..........................2. **PEDILANTHUS.**
Flowers not involucrate or, if so, the involucre containing only staminate or pistillate flowers, or the flower heads subtended by 2 distinct colored bracts; perianth present and usually well developed.
Ovules 2 in each cell of the ovary; stamens, at least the outer ones, opposite the sepals.
Pubescence of stellate scales; flowers dioecious; trees..3. **HIERONYMA.**
Pubescence none or of simple hairs; flowers monoecious; trees, shrubs, or herbs..........................4. **PHYLLANTHUS.**
Ovule 1 in each cell; stamens, at least the outer, alternate with the sepals.
Plants with twining, chiefly or wholly herbaceous stems.
Flowers in clusters subtended by 2 large, broad, green, pink, or cream-colored bracts..........................6. **DALECHAMPIA.**
Flowers not subtended by an involucre of large bracts......7. **TRAGIA.**
Plants not twining, rarely scandent, but then with hard woody branches.
Flowers in dichotomous cymes.
Flowers monoecious..........................8. **JATROPHA.**
Flowers dioecious..........................9. **ALEURITES.**
Flowers variously arranged, but not in dichotomous cymes.
Filaments inflexed at the apex in bud. Pubescence of stellate hairs.
5. **CROTON.**
Filaments straight.
Lobes of the staminate calyx valvate in bud.
Leaves deeply palmate-lobed..........................10. **RICINUS.**

Leaves not lobed.
  Petals present in the staminate flowers.
    Plants herbaceous ---------------------- 11. **CAPERONIA.**
    Plants woody.
      Leaves green, sericeous------------------12. **DITAXIS.**
      Leaves colored with red, white, or yellow, glabrous. 13. **CODIAEUM.**
  Petals none.
    Anthers 4-celled. Shrub with serrate leaves. 14. **BERNARDIA.**
    Anthers 2-celled.
      Flowers on long-pedicels, clustered in the leaf axils; leaves entire---------------------------------15. **ADELIA.**
      Flowers sessile or short-pedicellate, in spikes or racemes; leaves toothed.
        Anther cells separated; pistillate flowers subtended large toothed bracts; herbs or shrubs---16. **ACALYPHA.**
        Anther cells adnate; bracts entire; trees. 17. **ALCHORNEA.**
Lobes of the staminate calyx imbricate or separated in bud.
  Leaves deeply lobed----------------------------18. **MANIHOT.**
  Leaves not lobed.
    Leaves with scattered brown scales on the lower surface; flowers inclosed in a globose involucre-----------------19. **PERA.**
    Leaves without scales; flowers not in a globose involucre.
      Plants herbaceous, annual-------------25. **SEBASTIANIA.**
      Plants woody, trees or shrubs.
        Flowers paniculate.
          Plants usually scandent; branches of the panicle without glands--------------------------20. **OMPHALEA.**
          Plants erect; branches of the panicle bearing large sessile glands ------------------------------ 21. **MABEA.**
        Flowers spicate, or the pistillate sometimes solitary.
          Fruit fleshy; gland one at the base of the leaf blade. 22. **HIPPOMANE.**
          Fruit dry; glands 2 on the petiole or on the base of the blade.
            Fruit about 15-celled; glands borne on the leaf blade. 23. **HURA.**
            Fruit normally 3-celled; glands borne on the petiole. 24. **SAPIUM.**

This is one of the largest families of tropical plants, and its members are uncommonly diverse in general appearance. Most of them have milky sap, and the pubescence frequently consists of scales or of branched hairs. The leaves are usually alternate and simple; the flowers are unisexual, and the fruit most commonly a 3-celled and 3-lobed capsule.

Among the important members of the family are the South American species of the genus *Hevea* (Pará rubber trees), which furnish most of the rubber of commerce.

1. EUPHORBIA L. Spurge

Leaves all or mostly alternate, the uppermost (about the inflorescence) often opposite.
Plants armed with short stout spines. Shrub; leaves oblanceolate, entire. 1. **E. nereifolia** L.
Plants unarmed.
Leaves rounded-ovate, the blades often shorter than the petioles, entire; leaves about the inflorescence green. Annual herb. 2. **E. ocymoidea** L.
Leaves various but never rounded-ovate, the blades much longer than the petioles, usually lobed or toothed; leaves of the inflorescence usually colored with red.
Plants herbaceous, annual; native species--------3. **E. heterophylla** L.
Plants woody; cultivated species-------------4. **E. pulcherrima** Willd.
Leaves opposite, unequal at base. Small herbs.
Leaves entire. Plants glabrous---------------5. **E. ammanniodes** Kunth.
Leaves serrate, at least near apex.
Plants glabrous throughout, erect.
Seeds red-brown; cymes axillary----------------6. **E. hypericifolia** L.
Seeds black; cymes terminal.
Leaves oblong-linear, usually 7 times as long as broad or longer. 7. **E. hyssopifolia** L.
Leaves mostly oblong or oval and 2 to 3 times as long as broad. 8. **E. brasiliensis** Lam.
Plants pubescent, at least on the capsules.
Plants erect; involucres in cymes.
Cymes terminal; leaves oblong, finely crenulate. 9. **E. lasiocarpa** Klotzsch.
Cymes mostly axillary; leaves chiefly ovate, usually coarsely serrate. 10. **E. hirta** L.
Plants prostrate; involucres in small clusters in the axils of the leaves.
Glands of the involucre with reddish petal-like appendages. 11. **E. densiflora** Klotzsch.
Glands with minute obscure appendages--------12. **E. thymifolia** L.

Other species are found in Panama. The Euphorbias vary greatly in general appearance, but all have small flowers subtended by a calyxlike involucre. The fruit is a 3-lobed capsule.

E. nereifolia is an East Indian species, occasionally planted here for ornament. It is somewhat cactus-like in appearance, and in Salvador is called "tuna francesa."

E. ocymoidea is an inconspicuous herb, collected here only near Fort Clayton. *E. heterophylla* is a common weed, known in Salvador as "chilamatillo" and "hierba del duende."

E. pulcherrima, the well-known poinsettia grown for ornament everywhere in the tropics, is an American plant, but is probably not known in the wild state. The large leaves at the ends of the branches are bright red and very showy, but the true flowers are small and inconspicuous. In Central America the poinsettia is usually called "pascua" or "flor de pascua" (Christmas flower), because it is at its best about Christmas. In Costa Rica it is called "pastora."

E. ammannioides was collected by Fendler on beaches near Chagres. *E. hypericifolia* is a frequent weed, called "hierba de pollo." *E. hyssopifolia* grows chiefly in bogs, near the Pacific coast. *E. brasiliensis*, one of the most common weeds of the zone, is called here "golondrina," a name used widely for related species, some of which are employed in domestic medicine. *E. lasiocarpa* is rare about the zone. *E. hirta* is one of the most abundant weeds throughout tropical America. In Panama it is called "hierba de pollo," and by the West Indians "milkweed," but elsewhere in Central America it is known usually as "golondrina." This and the related species have gained an evil reputation recently because it has been found that they harbor the organisms causing tropical ulcers.

E. densiflora has been found here only at Bella Vista, but *E. thymifolia* is a common weed.

2. PEDILANTHUS Poit. SLIPPERPLANT

Pedilanthus tithymaloides (L.) Poit. is planted for ornament and tends to become naturalized. It is doubtless imported from the West Indies or northern South America. It is a shrub of 1 to 2 meters with succulent green stems and ovate, fleshy, nearly sessile leaves. The leaves often wither and fall, leaving the stems naked. The small flowers are inclosed in a large shoe-shaped red involucre. In Panama and Salvador the plant is called "pie de niño" (baby's-foot); in Salvador "bítamo real"; in Cuba "gallito colorado." The milky sap, caustic and possessing emetic properties, is sometimes employed in domestic medicine.

3. HIERONYMA Allem.

Hieronyma alchorneoides Allem., called here "pantano," is a frequent tree in the forests, in some places reaching a height of 30 meters. The leaves are petioled, alternate, elliptic, acuminate, and 12 to 25 cm. long, with minute stellate scales on both surfaces. The small flowers are dioecious, in lateral panicles; the fruit is a 1-seeded globose drupe, 2 to 3 mm. long. The deep reddish brown, rather hard, and heavy wood is used for general construction purposes, cabinet-work, posts, railroad ties, and boat building.

4. PHYLLANTHUS L.

Plants trees or shrubs.

Leaves sessile or nearly so, narrowly oblong, 2 to 3 mm. wide-- 1. **P. emblica L.**

Leaves petioled, mostly ovate to rounded, over 1 cm. wide.

Leaves rounded at apex, spotted with white---- 2. **P. nivosus** W. G. Smith.

Leaves acute or acuminate, green.

Flowers panicled on naked branches; fruit baccate. Leaves ovate, acute, 4 to 7 cm. long-------------------- 3. **P. acidus** (L.) Skeels.

Flowers borne on leafy branches, solitary or clustered in the axils of the leaves; fruit a capsule.

Stamens 3 or 2; capsule about 4 mm. in diameter; leaves mostly 3 to 5 cm. long, ovate-------------------------- 4. **P. conami** Swartz.

Stamens 4; capsule about 8 mm. in diameter; leaves oblong-elliptic, mostly 8 to 14 cm. long-------------- 5. **P. nobilis** (L. f.) Muell.

Plants small herbs. Leaves mostly about 1 cm. long or smaller, oblong or obovate.

Stems fistulose-thickened at base------------------ 6. **P. diffusus** Klotzsch.

Stems not thickened at base.

Seeds transverse-rugose on the back------------------- 7. **P. urinaria L.**

Seeds longitudinally striate on the back.

Plants usually with weak branches from the base; branches spreading, the upper ones surpassing the main stem------------ 8. **P. niruri L.**

Plants without basal branches; branches ascending, not exceeding the main stem------------------------------ 9. **P. carolinensis** Walt.

Other species occur in Panama. The leaves are alternate and entire, usually in 2 ranks. The flowers are very small and green, mostly solitary or clustered in the leaf axils. The fruit is baccate or capsular, in the latter case 3-celled.

P. emblica is a native of tropical Asia, called emblic or myrobalan. The slender branches with numerous small leaflets resemble a compound leaf, as in *P. acidus.* The green fruits, about 2 cm. in diameter and very sour, are eaten in the Orient, either raw or preserved. There is a large tree of this species growing in Ancón. *P. nivosus*, a shrub planted for ornament, is a native of the South Sea Islands. The leaves are rounded and handsomely variegated with white. In Porto Rico the plant is called "nevada"; the English name is "snow-bush."

P. acidus, the star-gooseberry, is a small tree, planted and in some places about the zone naturalized. The fruit, about 2 cm. in diameter, green, and very sour, is eaten raw, pickled, or preserved. In Costa Rica, Salvador, and Guatemala it is called "grosella" (gooseberry); in Salvador "guinda" and "pimienta"; in other regions "ciruela," "manzana estrella," and "cereza." Among the English names are "Otaheite gooseberry" and "West Indian gooseberry."

P. conami (*P. acuminatus* Vahl) is a common shrub or small tree. In Salvador it is called "pimientilla"; in Costa Rica "chilillo" and "gallina." *P. nobilis* also is a frequent shrub or small tree. In Salvador it is called "nistamal"; in Nicaragua "carillo"; in Porto Rico "higuillo," "millo," and "avispillo."

P. diffusus grows in swamps near the Pacific coast. *P. urinaria*, native of the Old World tropics, has been collected at Frijoles. *P. niruri* is a common weed, called by the Barbadians "seed on the leaf." In this species the capsules are 2 mm. in diameter. In *P. lathyroides* H. B. K., a closely related species, frequent in Central America and occurring in Panama, but not found thus far about the zone, the capsules are 3 mm. in diameter. *P. carolinensis* is a common weed on the Pacific slope.

5. CROTON L.

Leaves crenate or deeply lobed. Plants herbaceous.

Leaves deeply 3-lobed, the lobes acuminate................**1. C. lobatus** L.

Leaves crenate.

Stems hispid....................................**2. C. glandulosus** L.

Stems minutely stellate-pubescent................**3. C. tragioides** Blake.

Leaves entire.

Leaves mostly 3 to 4 cm. long, rounded at base and apex; herb or low shrub of sea beaches; racemes short, few-flowered........**4. C. punctatus** Jacq.

Leaves mostly 10 to 20 cm. long, acute or acuminate, cordate at base; trees or large shrubs; racemes long, many-flowered.

Pubescence of lower surface of leaves of coarse spreading stellate hairs; fruiting pedicels short, not recurved.

5. C. panamensis (Klotzsch) Muell. Arg.

Pubescence of lower surface of leaves of depressed stellate hairs; fruiting pedicels long, usually recurved........**6. C. billbergianus** Muell. Arg.

Other Crotons doubtless occur in Panama. They usually have stellate pubescence and alternate leaves; the flowers are borne in racemes, the pistillate below, the staminate above; the fruit is a 3-celled capsule.

C. lobatus is a weedy plant of infrequent occurrence. *C. glandulosus* also is a weed, and not common. The stiff hairs of this plant sting slightly. *C. tragioides* is common, and is said to be called "coquillito de cerro." *C. punctatus* is abundant on beaches of the Atlantic coast. *C. panamensis* is a conspicuous tree, especially on the Atlantic slope, with large flannel-like leaves. It reaches a height of 12 meters or more. Here it is called "sangrillo"; in Costa Rica "targuá";

in Mexico "sangre de drago" and "sangregrado." The sap turns red when exposed to the air. *C. billbergianus* is an endemic species, frequent on the Atlantic slope, a large shrub or small tree. It is called "baquero."

Croton eluteria (L.) Swartz, of the Bahamas, produces the cascarilla bark of commerce, employed in medicine as a tonic.

6. DALECHAMPIA L.

Leaves all simple, broadly ovate-cordate, nearly glabrous; bracts pink.
1. D. dioscoreaefolia Poepp. & Endl.
Leaves all or mostly 3-lobed or 3-parted; bracts green or cream-colored.
  Leaves 3-parted, with narrow leaflets, glabrate beneath. Bracts green.
  2. D. panamensis Pax & Hoffm.
  Leaves merely 3-lobed, usually densely pubescent beneath.
    Bracts green, deeply 3-lobed............................**3. D. scandens** L.
    Bracts cream-colored, shallowly 3-dentate at apex....**4. D. tiliaefolia** Lam.

The plants are herbaceous vines with long-petioled leaves, the monoecious flowers borne in long-stalked clusters, each head subtended by 2 broad leaflike bracts. The pistillate sepals are laciniate and usually covered with stiff stinging hairs.

D. dioscoreaefolia is frequent, and rather showy because of the handsome bracts, which are veined with dark red. *D. panamensis* is widely distributed but not common. *D. scandens* grows on the Pacific slope. In Salvador it is called "bejuco de pan." *D. tiliaefolia* (pl. 42), common everywhere, is showy because of the large cream-colored bracts, 3 to 5 cm. long.

7. TRAGIA L.

Tragia volubilis L. occurs rather infrequently on the Pacific slope. It is a slender herbaceous vine, covered with stiff hairs that sting painfully. The leaves are oblong to ovate, serrate, cordate at base, and the small monoecious flowers are racemose. In Salvador the plant is called "pan caliente"; in Mexico "ortiguilla"; and in Porto Rico "pringamoza."

8. JATROPHA L.

Leaves peltate; flowers bright red......................**1. J. podagrica** Hook.
Leaves not peltate; flowers green or white.
  Plants herbaceous, armed with long stinging bristles. Leaves deeply lobed.
  2. J. urens L.
  Plants shrubs or small trees, usually without stinging hairs (these sometimes present in *J. aconitifolia*).
    Flowers green; leaves shallowly 3 or 5-lobed..............**3. J. curcas** L.
    Flowers white; leaves deeply lobed, the lobes again lobed.
    4. J. aconitifolia Mill.

One or more additional species are found in Panama. The plants have alternate long-petioled leaves and the monoecious flowers are in cymes. The fruit is a capsule.

J. podagrica is believed to be a native of Central America, but apparently it is known only in gardens, where it is grown for ornament. It is somewhat shrubby, but usually less than 4 feet high. The leaves have 3 or 5 broad lobes and are glaucous beneath. The base of the stem, at the surface of the soil, is usually very large and turniplike. The current name for this species is "ruibarbo" (rhubarb).

J. urens is a weed, occurring rather frequently on the Pacific slope. The stiff hairs which cover all parts of the plant cause great pain when they sting the flesh, the pain often lasting for a whole day or longer. In Panama the plant is called "ortiga" and "pringamoza"; in Guatemala "chichicaste"; and in Mexico "mala mujer."

J. curcas is frequent here, and it is one of the common plants of tropical America. It is a shrub or small tree, whose branches when broken exude milky sap. The fruit is green and egg-shaped, 3 to 4 cm. long, containing usually 2 seeds about 2 cm. long. The seeds, called "piñones," have an agreeable flavor, but they have purgative properties and are likely to cause serious trouble if eaten in quantity. Children are reported to have died from the effects of eating them. They contain 25 to 40 per cent of an odorless oil which has been utilized in paints, as a lubricant, and for making soap. The plant is much used in domestic medicine. In Panama the leaves are applied as poultices to reduce swelling. The shrub is often planted for hedges, because stock do not eat it. In Mexico certain scale insects that live on the plant produce a kind of lac used for varnish. The leaves are said to be employed in the Philippines for stupefying fish. One of the names applied in Panama to this species is "árbol santo" (holy tree), there being a popular belief that the branches shed blood during Holy Week. The explanation of this superstition is the fact that the sap turns red upon exposure to the air. The usual name for the plant here, as in many other regions, is "coquillo," but other names are "tempate" (Salvador and Honduras to Costa Rica); "tapate" (Costa Rica); and "sangregado" (Mexico).

The seeds of *Jatropha curcas* are sometimes roasted and eaten, the heat driving off the poisonous substances which they contain, but great caution should be used in eating them. There appears to be also a race of this plant in which the raw seeds are innocuous.

J. acontifolia occurs occasionally on the Pacific coast, but is not native. It has a very thick, short trunk, few branches, and rather showy flowers. The young leaves are cooked and eaten here as well as in other parts of Central America, and in Panama the leaves are applied as poultices to cure skin diseases. The local name is "coquillo." In Salvador the plant is called "chaidra," "copapayo," "chayo," "chaira," and "papayilla"; in Yucatán "chaya." In general appearance it suggests the papaya.

9. **ALEURITES** Forst.

A. moluccana (L.) Willd., the candlenut, native of Malaysia and Polynesia, is planted frequently as a shade tree. It is a medium-sized tree with large, long-petioled, chiefly ovate leaves which are often lobed, and bear numerous fine brownish stellate scales. The fleshy ovoid fruit, 5 to 6 cm. long, contains 1 or 2 hard-shelled oily seeds.

10. **RICINUS** L. Castor-bean

The genus consists of a single species, *R. communis* L., native probably of tropical Africa, but now widely dispersed in most tropical regions. The castor-bean plant grows wild here and there about the zone, and is often seen around houses. It is essentially an annual but often persists for several years and become tree-like, although seldom more than 4 meters high in Central America. The large long-stalked leaves are glabrous and palmately lobed, and the flowers are borne in stout racemes. The capsule is uually covered with spinelike tubercles. There is great variation in the color of the seeds. The seeds yield castor-oil ("aceite de castor," "aceite de ricino") of commerce, used in medicine as a purgative. The oil is used as a lubricant, in the manufacture of soap, and in dyeing cotton goods. In Asia silkworms are fed upon the leaves. The plant is little grown in Central America, although in some localities the oil is extracted upon a small scale. In Central America the plant is called "higuerilla" and "higuero."

11. CAPERONIA St. Hil.

Stems glandular-hirsute; leaves ovate or lanceolate..1. **C. palustris** (L.) St. Hil.
Stems with sparse appressed eglandular pubescence; leaves linear.
2. **C. angusta** Blake.

These plants are low herbs with alternate serrate leaves, and small monoecious flowers in short racemes. *C. palustris* is a common weed, usually in wet soil. *C. angusta* is an endemic species, frequent in swamps or marshes on the Pacific slope.

12. DITAXIS Vahl

Ditaxis macrobotrys Pax & Hoffm. is an endemic species, known only from Alhajuela. It is a shrub with nearly sessile, oblanceolate or obovate, acuminate, thinly sericeous, serrate leaves. The pistillate flowers are solitary and long-stalked, the staminate in few-flowered axillary inflorescences.

13. CODIAEUM Juss.

One of the common ornamental plants of the tropics is *C. variegatum* (L.) Blume, native of the Pacific islands. It is used extensively about the zone for hedges, being with hibiscus and bougainvillea probably the most abundantly planted ornamental shrubs. In some places, as on Taboga, it tends to become naturalized. The leaves of this plant are extraordinarily variable, ranging from obovate to linear, and colored in an almost endless number of combinations of green, red, yellow, white, and pink. The plants are almost always called crotons, although not closely related to the native plants belonging to the genus *Croton.*

14. BERNARDIA Adans.

Bernardia macrophylla Standl. is an endemic species, collected near the Río Tecumen. It is a shrub with oblanceolate-oblong crenate-serrate leaves, pubescent beneath. The greenish flowers are borne in slender axillary spikes.

15. ADELIA L.

Adelia triloba (Muell. Arg.) Hemsl. is a common shrub or small tree. The branchlets are usually spinose, the leaves lance-oblong to obovate, acuminate, entire, and nearly glabrous, but barbate beneath in the axils of the nerves. The flowers are dioecious, long-pedicellate and clustered in the leaf axils, and the fruit is a 3-lobed capsule. At least one other species is known from Panama.

16. ACALYPHA L.

Plants herbaceous.
  Spikes all axillary. Leaves mostly obtuse...1. **A. arvensis** Poepp. & Endl.
  Spikes partly terminal.
    Leaves abruptly acuminate....................2. **A. alopecuroides** Jacq.
    Leaves obtuse or acutish.......................3. **A. aristata** H. B. K.
Plants shrubs or small trees.
  Leaves reddish or spotted with white or pink, glabrate; cultivated for ornament..4. **A. wilkesiana** Muell.
  Leaves green; native species.
    Pistillate flowers pedicellate. Leaves broadly ovate, velvety-pubescent beneath....................................5. **A. villosa** Jacq.
    Pistillate flowers sessile.
      Leaves broadly ovate, mostly 10 to 15 cm. wide, velvety-pubescent beneath; pistillate spikes without staminate flowers.
      6. **A. macrostachya** Jacq.
      Leaves lance-oblong or elliptic-oblong, mostly 3 to 6 cm. wide, pubescent or glabrate beneath; pistillate spikes with staminate flowers above.
      7. **A. diversifolia** Jacq.

The Acalyphas have alternate, usually crenate, petioled leaves with stipules, and monoecious flowers in elongate spikes. The pistillate flowers are subtended by a leaflike toothed bract. The fruit is small 3-celled capsule.

A. arvensis is a common weed, with short, very dense, oblong spikes. In Salvador it is called "gusanillo," "tarco," and "taba de pollo." *A. alopecuroides* has been found here only on Taboga, and *A. aristata* has been collected at Gamboa.

A. wilkesiana, the copperleaf, is a shrub, native of the Pacific islands, much grown for ornament all over Central America and one of the commonest ornamental plants of the zone. It is often planted for hedges. The large ovate leaves exhibit wide variation in coloring. An English name is "Jacob's-coat." In Salvador the shrub is called "manto de Jesús;" in Nicaragua and Porto Rico "primavera."

A. villosa has been collected here only on Taboga Island. *A. macrostachya* is a frequent forest shrub. *A diversifolia* is a very common shrub here, as it is through most of Central America.

17. ALCHORNEA Swartz

Alchornea costaricensis Pax & Hoffm., a small tree, is frequent on the Atlantic slope. Its leaves are elliptic-ovate, 7 to 15 cm. long, acuminate, remotely crenate, and nearly glabrous. The flowers are dioecious, the staminate in very long, drooping spikes.

18. MANIHOT Adans. CASSAVA

Manihot esculenta Crantz, the cassava plant, is called "yuca" everywhere in Central America. It is said to be a native of Brazil, but has long been cultivated in Central America and elsewhere in tropical America for its edible roots. It is a large bushy herb, or sometimes somewhat woody, with long-petioled leaves deeply divided into 3 to 7 acuminate lobes. The leaves are glabrous and very glaucous beneath. The large monoecious flowers are green tinged with red, in small panicles. The capsule has 6 narrow wings.

The large roots somewhat resemble yams and sweetpotatoes. In Central America they are a common vegetable, being boiled and eaten like potatoes. In some parts of South America, particularly Brazil, the grated roots are the chief food staple, taking the place of bread. Starch also is obtained from the roots, likewise tapioca. There are two well-marked varieties of the plant, one whose roots have no harmful properties, and another whose roots are very poisonous. The toxic principle is destroyed by heat. By cultivators numerous varieties of the plant are recognized, differing in the form of the leaves and in the color of the stems. Cassava is much grown in Panama and also occurs wild, having escaped from cultivation.

19. PERA Mutis

The only Central American species, *P. arborea* Mutis, is frequent in forests. It is a tree of large or medium size, with alternate petioled entire oblong-elliptic leaves, which are glabrous except for a few scattered brown scales on the lower surface. The small flowers are clustered on usually naked branches. The fruit is a hard rugose capsule. At Fató the tree is called "feli," and the strong white timber is utilized for construction purposes.

20. OMPHALEA L.

Omphalea diandra L., frequent on the Atlantic slope in swamps or in thickets along the beaches, is an arching or climbing shrub with large alternate oval long-petioled leaves. The petiole bears two conspicuous glands at its apex. The small greenish monoecious flowers are arranged in broad panicles. The capsule is said to be as large as an orange.

21. **MABEA** Aubl.

A common shrub or small tree is *M. occidentalis* Benth. It has very slender branches, alternate oblong short-petioled leaves, and monoecious flowers in racemelike terminal panicles. The staminate flowers are small balls of numerous stamens, and the fruit is a 3-lobed capsule. The branches of the panicle bear conspicuous sessile glands.

22. **HIPPOMANE** L. MANCHINEEL

The only species is *H. mancinella* L., a small tree common on seashores in many parts of tropical America, and abundant on both coasts of the Isthmus, where it forms dense thickets along the beaches. The bark is smooth and pale brown; the leaves alternate, long-petioled, broadly ovate, glabrous, and finely serrate. The green flowers are arranged in stiff spikes. The fruit is over an inch in diameter and resembles a small green apple.

The early Spanish explorers upon meeting with this tree believed they had found crabapples in the New World, and ate the fruit, in some cases with fatal results. After proving its poisonous properties they immediately gave it a fearful reputation, affirming that a person who rested beneath the tree would become blind or even die. There is no doubt that the milky sap is highly irritant, causing severe inflammation, although, as in the case of poison-ivy, some persons seem to be immune to it. Smoke from the burning wood sometimes causes inflammation of the eyes. It is said that the sap was employed by the Caribs for poisoning their arrows.

The wood is yellowish brown, variegated with brown and black, of medium hardness and weight, suggesting walnut, of fine texture, easy to work, durable, and susceptible of a good polish. It is excellent for cabinet work, and has been used in tropical America for many purposes. Care must be taken even in working with the dry lumber, and it is evident that felling the trees is hazardous. It is stated that woodcutters build a fire about the trunk and char the bark before cutting down the trees.

The English term manchineel is a corruption of the Spanish "manzanillo" (little apple), the name in use throughout Central America. The name has been given to many coast towns, such as the well-known port of Manzanillo, Mexico. The tree is sometimes called also "manzanillo de playa."

23. **HURA** L. SANDBOX

Hura crepitans L. (pl. 43) is frequent about the zone and is often planted as a shade tree. There are two species of *Hura* in Central America, distinguished by the arrangement of the stamens. Their exact ranges are not well known, since most herbarium specimens are without flowers, but the other species, *H. polyandra*, is northern, extending from Mexico southward, but probably not so far as Panama. Both species are alike in general appearance and in their properties.

H. crepitans is a large or medium-sized tree, its trunk usually covered densely with short sharp spines so as to resemble a grater. The deciduous leaves are long-petioled, cordate-ovate, and toothed. The stamens are arranged on a long column. The fruit is a capsule 8 to 10 cm. broad, shaped like a pumpkin, consisting of about 15 1-seeded woody cells which resemble the sections of an orange. When ripe the fruit explodes violently with a loud report, throwing the seeds far away from the tree. In colonial days the young capsules were dried and used as containers for the sand employed for drying or blotting ink, hence the name sandbox.

The wood is pale yellow, creamy white, or yellowish brown, light and soft, and fairly resistant to decay. It has many local uses. The milky sap is poisonous and upon the skin is said to cause serious inflammation. In western Mexico the sap mixed with meal or other substances is thrown in streams to stupefy fish. The seeds, which contain an oil with drastic purgative properties, are said to be used for poisoning noxious animals.

In Central America the trees are usually known as "javillo," and the name "tronador" is reported as in use in Panama, as well as the English name of "white cedar." Other names are "haba" (Cuba); "ceiba de leche," "castañeto" (Colombia); and "tetereta" (Guatemala).

24. SAPIUM Jacq.

Leaves linear-oblong.................................**1. S. aucuparium** Jacq.
Leaves oblanceolate or obovate-oblong.................**2. S. caudatum** Pittier

Additional species occur in Panama, and at least one other, represented in the herbarium only by sterile specimens, grows in our region. The plants are trees with milky sap; the leaves have glandular-serrate margins, and the petiole bears 2 stalked glands near its apex. The monoecious flowers are spicate, and the fruit is a small capsule.

Both species are of frequent occurrence and are called "olivo" or "ñipe." There seems to be some variation in the properties of the species of *Sapium*. In Mexico and in Salvador, for instance, the sap is reputed as poisonous as that of manchineel, and the trees are often left standing when ground is cleared. In Panama, however, the sticky sap, when it has coagulated, is chewed by boys, who place it on twigs for the purpose of catching small birds.

Some of the South American species of *Sapium* are important sources of commercial rubber.

25. SEBASTIANIA Spreng.

Depauperate specimens, apparently referable to the widespread *S. corniculata* (Vahl) Muell. Arg., have been collected in the savanna beyond Panama City. The plant is a much-branched annual with petioled, oblong to ovate-lanceolate, appressed-serrulate leaves.

78. ANACARDIACEAE. Cashew Family

- Leaves pinnate.
  - Calyx accrescent after anthesis..........................**1. ASTRONIUM.**
  - Calyx not accrescent.
    - Fruit dry, or nearly so, about 5 mm. in diameter; leaflets rounded at apex, entire or crenate; cultivated tree......................**2. SCHINUS.**
    - Fruit juicy, usually over 2 cm. long; leaflets mostly acutish to acuminate, entire or nearly so; native trees but often planted....**3. SPONDIAS.**
- Leaves simple.
  - Leaves pale beneath. Stamens 5..........................**4. SEMECARPUS.**
  - Leaves green beneath.
    - Stamens 1 to 5..**5. MANGIFERA.**
    - Stamens 8 to 10..**6. ANACARDIUM.**

Several other genera are represented elsewhere in Panama. The Anacardiaceae are trees or shrubs with alternate leaves. The flowers are small and panicled, with a 3 to 7-cleft calyx, 3 to 7 petals, and as many or twice as many stamens. The fruit is commonly drupaceous.

1. ASTRONIUM Jacq.

Astronium graveolens Jacq. is of frequent occurrence, at least on the Pacific slope. It is a large tree with pinnate leaves, the leaflets lance-oblong, thin, and coarsely serrate or nearly entire. In Panama the tree is called "zorro"; in Salvador "ronrón"; in Honduras "palo obero." The wood is said to be valuable for construction purposes and for cabinet work.

2. SCHINUS L.

Schinus terebinthifolius Raddi, native of Brazil, is planted in Balboa. It is a small tree with glabrous leaves and small axillary panicles of white flowers. The bright red fruit, suggesting that of sumac, is very showy.

To this genus belongs the peppertree, *S. molle* L., which is much planted in California and occasionally in Central America.

3. SPONDIAS L.

Panicles lateral on old wood; leaflets acute to rounded at apex, mostly 2 to 5 cm. long..........1. **S. purpurea** L.

Panicles terminal; leaflets abruptly obtuse-acuminate, mostly 6 to 10 cm. long. 2. **S. mombin** L.

The plants are small trees with odd-pinnate deciduous leaves and small, white or pinkish flowers. The fruit contains a single large, 3 to 5-celled stone.

S. purpurea, the Spanish-plum (pl. 44), is common, especially on the Pacfic slope, growing usually in open fields or on brushy hillsides. Often it is only a shrub, with few thick sprawling branches. The fruit, resembling a small plum and 2 to 3 cm. long, is usually red at maturity. It has a flavor much like a plum, hence it is not surprising that the Spaniards gave it the name "ciruela," by which it is generally known. The tree is called "jobo" or "ciruelo," and in some regions the fruit is called "jocote." The fruit is much eaten when ripe, and some persons like it when green. Nearly always it is eaten raw, but sometimes it is cooked, and it is employed for making "frescos," of which Latin-Americans are so fond. It is sometimes fermented to produce an intoxicating beverage. The leaves have an acid flavor. The tree is one of those most frequently planted for living fence posts.

S. mombin (*S. lutea* L.), the hogplum, is a common tree in this region, and is frequently planted for shade, attaining a height of 10 to 15 meters. The fruit is yellow, larger than in *S. purpurea*, but of inferior quality, with an unpleasantly pungent flavor. In Panama the tree is called "jobo."

The wood of both species is soft and almost useless.

4. SEMECARPUS L. f.

In Ancón there have been planted trees of *S. anacardium* L. f., the marking-nut tree, native of India. It has large obovate leaves, rounded at apex, and terminal panicles of small white flowers. The fruit is a black drupe about 2.5 cm. long. Its black acid juice is employed in India for printing cotton cloth.

5. MANGIFERA L. MANGO

The mango, *M. indica* L., the favorite fruit among the people of Central America, is planted commonly here, as it is everywhere in tropical America. Most of the local trees bear inferior fruit, but progress is being made in their improvement. Mangos (the Spanish name is the same) have run wild in the forests about the zone, and there are many fine trees along the old Las Cruces

Trail. This is one the trees upon which orchids grow most luxuriantly. Mangos were brought to Mexico and Central America in early colonial days, probably from the Philippines.

6. ANACARDIUM L. Cashew

Panicles little longer than the leaves, with gray pubescence; leaves oval-obovate, mostly 10 to 14 cm. long; stamens 7 or 8, one much longer than the others. **1. A. occidentale** L.

Panicles much longer than the leaves, with brown pubescence; leaves obovate-oblong, mostly 15 to 25 cm. long; stamens 10, 4 much longer than the others.......................... **2. A. excelsum** (Bert. & Balb.) Skeels.

A. occidentale L. is one of the common trees of the region, especially in fields and on dry brushy hillsides. It seldom reaches a height of 10 meters. The flowers are reddish or purplish. The fruit is very curious, consisting of a large grayish kidney-shaped nut, borne on the apex of what appears to be a fleshy fruit. This "fruit" is either red or yellow, rather spongy, soft, and juicy, and strongly suggests a bullnose pepper in its shape, size, and color. It has a distinctive flavor and is much eaten, although not considered one of the best Central American fruits. Throughout Central America the fruit is called "marañón," and by the West Indians "cashew."

The fruit is sometimes employed for flavoring iced drinks, and intoxicating beverages are made from it. In eating the fruit care must be taken to remove the nut, for this contains an oil, cardol, which is acrid and caustic, and blisters the skin. By roasting the oil is driven off, and the seeds are then edible, resembling almonds in flavor. They are very good, and are much used locally for making candy. The oil is sometimes used to preserve wood and bookbindings from attacks of termites and other insects, and a gum exuding from the bark is utilized for the same purpose. The wood is grayish, pinkish, or brownish, moderately hard and strong, but not very resistant to decay. It is employed in Central America for various purposes.

A. excelsum (*A. rhinocarpus* DC.; pl. 45) is a common forest tree, frequently attaining a height of 20 to 35 meters, with a clean trunk 10 to 18 meters high. It is one of the largest trees of Panama, and in some places, as along the Bayano River, is reported to form dense stands. The fruit is edible, like that of *A. occidentale*. In some parts of Panama the crushed bark is employed as a fish poison. The wood is light brown or yellow, light and soft, rather fine, easy to work and taking a high natural finish. Locally it is used for dugout canoes, kitchen utensils, and miscellaneous purposes. About the zone this tree is called "espavé"; in Costa Rica "espavel"; in Colombia "caracolí"; in Venezuela "mija" and "mijagua." The West Indians in Panama call it "wild cashew."

79. CELASTRACEAE. Bittersweet Family

1. MYGINDA Jacq.

Myginda eucymosa Loes. & Pitt., of occasional occurrence in forests of the Atlantic slope, is a shrub or small tree with opposite, ovate-elliptic, acuminate, glabrous, obscurely serrulate leaves. The small whitish flowers, in axillary cymes, have 4 petals and 4 stamens. The fruit is a lop-sided red drupe about 1 cm. long.

80. HIPPOCRATEACEAE. Hippocratea Family

Fruit dry, of 3 carpels, these connate at base, compressed vertically and winglike; seeds broadly winged..............................1. **HIPPOCRATEA.**

Fruit baccate, terete, 1 to many-seeded; seeds not winged.......2. **SALACIA.**

No other genera are recognized in America, but the characters of the plants referred to these two are so diverse that it seems certain that with ample material available for their intelligent study, it will be necessary to recognize some of the numerous genera segregated by Miers.

The plants are trees or shrubs, usually scandent, with small deciduous stipules and normally opposite leaves which are simple and entire or dentate. The very small, perfect flowers are greenish, in axillary cymes. They have a 5-parted calyx; usually 5 petals, which are often toothed; normally 3 stamens, inserted on a conspicuous disk; and a 3-celled ovary, with simple or trifid stigma.

1. HIPPOCRATEA L.

Hippocratea volubilis L., of occasional occurrence in forests of the Atlantic slope, is a large woody vine with oblong to oval, short-petioled, crenate-serrate or nearly entire leaves. The 3 carpels of the fruit are flat, spreading, oblong, about 8 cm. long, splitting down the middle, and enclosing several large winged seeds.

Other species occur in remote parts of Panama. Several have been reported from the zone, but they are probably synonymous with *H. volubilis.*

2. SALACIA L.

Fruit globose or nearly so; leaves mostly 2 to 2.5 cm. wide.
1. **S. scandens** (Aubl.) Griseb.

Fruit oval or obovoid; leaves usually broader.
  Testa of the seed membranaceous...................2. **S. pruinosa** Seem.
  Testa osseous..............................3. **S. praecelsa** (Miers) Standl.

Salacia scandens, a small tree with oblong or oblong-elliptic, entire leaves, has been collected in forests of the Atlantic slope, and is said to be called "fruta de mono." *S. pruinosa* and *S. praecelsa* are imperfectly understood species. *S. pruinosa* was described from the Pacific slope, and *S. praecelsa* is occasional in the Atlantic forests. The latter is sometimes called "garrotillo."

81. STAPHYLEACEAE. Bladdernut Family

1. TURPINIA Vent.

Turpinia paniculata Vent. has been collected at Gamboa. It is a tree of 10 to 15 meters with opposite odd-pinnate leaves having 5 to 11 ovate to lance-oblong, crenate or entire, glabrous leaflets. The small white flowers, borne in terminal panicles, have 5 petals and 5 stamens. The 3-celled fruit is subglobose, indehiscent, and 1 to 1.5 cm. in diameter. In Porto Rico the tree is called "avispillo," "cedro hembra," and "sauco cimarrón."

82. SAPINDACEAE. Soapberry Family

Plants scandent, the inflorescence usually bearing tendrils.
  Fruit inflated and bladder-like; stems herbaceous...1. **CARDIOSPERMUM.**
  Fruit not inflated; stems woody.
    Fruit of 3 samaras, the seed borne at the apex of the samara.
2. **SERJANIA.**
    Fruit a terete or 3-winged capsule.....................3. **PAULLINIA.**

Plants erect, without tendrils.
  Leaves twice pinnate, with very numerous small leaflets. Fruit drupaceous. 4. **DIPTERODENDRON.**
  Leaves once pinnate, sometimes with only 3 leaflets.
    Leaflets 3. .... 5. **ALLOPHYLUS.**
    Leaflets 4 or more.
      Fruit dehiscent.
        Stamens long-exserted; fruit about 6 cm. long .... 6. **BLIGHIA.**
        Stamens not long-exserted; fruit usually 2 cm. long or less.
          Sepals distinct .... 7. **CUPANIA.**
          Sepals united .... 8. **MATAYBA.**
      Fruit indehiscent.
        Fruit 2-lobed, one of the lobes very small, representing an abortive cell. 9. **SAPINDUS.**
        Fruit not lobed.
          Petals each with a scalelike bearded appendage; leaflets more than 4. 10. **TALISIA.**
          Petals not appendaged; leaflets 4 .... 11. **MELICOCCUS.**

The plants are all trees or shrubs, except *Cardiospermum.* They have alternate compound leaves, without stipules. The flowers are small and regular or nearly so, with 4 or 5 sepals or calyx lobes, 3 to 5 petals, 5 to 10 stamens inserted on a disk, and a 2 to 4-celled ovary.

1. CARDIOSPERMUM L. BALLOONVINE

Flowers 5 to 6 mm. long; fruit 5 to 7 cm. long, longer than broad. 1. **C. grandiflorum** Swartz.
Flowers 2.5 to 3 mm. long; fruit about 1 cm. long, broader than long. 2. **C. microcarpum** H. B. K.

The plants are herbaceous vines with mostly twice-ternate leaves and toothed or lobed leaflets. The flowers are corymbose, white, and in *C. grandiflorum* rather showy. The fruit is an inflated bladder-like capsule containing 3 globular seeds with a white, broadly heart-shaped hilum. *C. grandiflorum* is very common in thickets, at least on the Pacific slope, but *C. microcarpum* is infrequent.

2. SERJANIA Schumach.

Cells of the fruit hispid with long stiff hairs; fruit 4 to 4.5 cm. long. 1. **S. cornigera** Turcz.
Cells of the fruit glabrate or hirtellous; fruit usually less than 3 cm. long.
  Leaves ternate-pinnate, with numerous leaflets. Leaflets small, coarsely crenate .... 2. **S. trachygona** Radlk.
  Leaves twice ternate, with 9 leaflets.
    Leaflets coarsely crenate, copiously pubescent beneath. 3. **S. rhombea** Radlk.
    Leaflets entire or remotely serrate, glabrous or nearly so.
      Partition walls of the fruit nearly as broad as the cells, the cells firmly united; outer sepals glabrate .... 4. **S. insignis** Radlk.
      Partition walls much narrower than the cells, the cells lightly coherent; outer sepals densely tomentose.
        Cells of the fruit glabrate, strongly compressed. 5. **S. mexicana** Willd.
        Cells hirtellous, subglobose .... 6. **S. atrolineata** Sauv. & Wright.

Other species are known from Panama. The Serjanias are large woody vines, the racemes or panicles usually provided with tendrils. In our species the leaves are twice ternate or ternate-pinnate and the flowers small and white.

S. cornigera, occasional in wet forest on the Atlantic slope, is endemic in Panama. Its flowers are larger than those of the other species. *S. trachygona* is infrequent and *S. rhombea* very common. *S. microcephala* Radlk., described from Ancón Hill, is apparently only a form of *S. rhombea*.

S. insignis is a common vine and *S. mexicana* is of occasional occurrence. In Costa Rica the latter is called "turizo"; in Guatemala and Mexico "barbasco." *S. atrolineata* is of frequent occurrence on the Pacific slope.

The species of *Serjania* and *Paullinia* are used in many parts of tropical America as fish poisons, the macerated branches being thrown into the water, whereupon the fish become stupefied and float on the surface, so that they may be easily captured. Many other plants are employed thus in various parts of the world.

3. PAULLINIA L.

Leaves with 3 leaflets.
  Fruit angled; leaflets broadly elliptic or ovate, rounded at base. 1. **P. turbacensis** H. B. K.
  Fruit terete; leaflets oblong-elliptic, usually cuneate at base...2. **P. cururu** L.
Leaves with 5 or more leaflets.
  Fruit winged; leaves biternate or ternate-pinnate.
    Flowers in small clusters shorter than the petioles; leaves ternate-pinnate. 3. **P. glomerulosa** Radlk.
    Flowers in racemes, these usually longer than the leaves; leaves biternate. 4. **P. fuscescens** H. B. K.
  Fruit not winged, terete; leaves once pinnate.
    Flowers in dense broad clusters shorter than the petioles...5. **P. alata** Don.
    Flowers in racemes, these usually as long as the leaves.
      Bracts of the raceme much exceeding the flower clusters. 6. **P. bracteosa** Radlk.
      Bracts much shorter than the flower clusters........7. **P. pinnata** L.

Other species occur in Panama. They are large woody vines with small white flowers, the inflorescences usually bearing tendrils. The fruit is commonly red and contains 1 to 3 black seeds which have a white aril.

P. turbacensis is frequent in forests of the Atlantic slope and *P. cururu* is occasional. In Nicaragua the latter is said to be known as "chilmecate"; in Sinaloa it is called "colorín"; in Venezuela "azucarito." *P. glomerulosa* is a species of the Atlantic slope. *P. fuscescens* is rather common. On Taboga it is called "hierba de alacrán," being used as a remedy for the bites of venomous insects. In Salvador the same species is called "nistamal," "nistamalillo," "barbasco," and "bejuco cuadrado"; in Honduras "cainpalaca"; in Mexico "bejuco costillón," "pico de guiloche," and "panoquera"; in Venezuela "bejuco de mulato." The white aril surrounding the seeds is eaten.

P. alata grows in forests of the Atlantic slope and *P. bracteosa* has been found in the same region. *P. pinnata* is frequent on the Atlantic slope. This is a widely distributed species, known in Honduras as "nistamal" and "pate"; in Salvador as "chilmecate," "nistamalillo," and "pozolillo"; in Mexico as "barbasco," "bejuco vaquero," and "cuaumecate." In the British West Indies it is sometimes called "bread-and-cheese." The stems, like those of related plants, are often used as a substitute for rope. The seeds are believed to be poisonous, and are reported to have been employed for criminal poisoning.

The seeds of *P. cupana* H. B. K. and other South American species are official in the U. S. Pharmacopoeia, under the name "guarana." They contain an alkaloid, guaranine, believed to be identical with caffeine, and employed as a remedy for chronic diarrhea. The Indians of Brazil prepare from the seeds a beverage that they use like coffee.

4. DIPTERODENDRON Radlk.

The only species is *D. costaricense* Radlk., which grows in forests on the Pacific watershed. It is a large tree with fernlike foliage, the leaves twice pinnate and composed of very numerous small serrate leaflets. The flowers are borne in large panicles; the fruit is red and about 2 cm. broad. In Darién the tree is called "harino" or "jarino."

5. ALLOPHYLUS L.

Leaflets scabrid-puberulent beneath____1. **A. occidentalis** (Swartz) Radlk.
Leaflets at maturity glabrous or nearly so______2. **A. psilospermus** Radlk.

The plants are shrubs or small trees with 3-foliolate leaves, the leaflets elliptic or ovate, thin, acuminate, and serrate or nearly entire. The small whitish flowers are in axillary panicles, and the fruit is a red drupe about 6 mm. long. *A. occidentalis* is common on the Pacific slope and *A. psilospermus* is occasional on the Atlantic slope. The latter species is called "huesillo" in Costa Rica.

6. BLIGHIA Koen. AKEE

The only species is *B. sapida* Koen., native of West Africa, but planted in Central America, mostly in the regions where West Indians have settled. It is a small tree with pinnate leaves having about 10 large, elliptic or oblong, nearly glabrous leaflets, and small fragrant white flowers in axillary racemes. The fruit is a 3-celled, green or red capsule, containing large black seeds subtended by a white aril. The aril is the edible part of the plant, being usually fried. Raw it is said to be a deadly poison. In Central America the fruit is usually called "seso vegetal" (vegetable brain); the West Indians know it as "akee," a name doubtless of African origin; in Panama it is called also "huevo vegetal."

7. CUPANIA L.

Leaflets whitish beneath, minutely but densely tomentose__1. **C. cinerea** Poepp.
Leaflets green beneath.
  Petiole and rachis densely brown-hirsute______2. **C. fulvida** Triana & Planch.
  Petiole and rachis glabrous or with minute appressed pubescence.
    Leaflets entire, acuminate____________3. **C. seemanni** Triana & Planch.
    Leaflets sinuate-crenate, usually rounded or retuse at apex. 4. **C. latifolia** Kunth.

The Cupanias are shrubs or sometimes fair-sized trees with pinnate leaves composed of a few large, thick, entire or serrate leaflets. The small whitish flowers are arranged usually in large terminal panicles, and the fruit is a 3-lobed capsule containing 3 arillate seeds. *C. cinerea* is not infrequent in the forests. It is called "gorgojo" (grub) and "gorgojero," probably because some conspicuous caterpillar feeds upon the leaves. *C. fulvida*, common in the forests and known by the same names, is called also "candelillo." *C. seemanni* is common, and *C. latifolia* has been collected at Alhajuela.

Young plants of this genus have at first simple leaves, resembling the leaflets of mature plants.

8. MATAYBA Aubl.

Leaflets entire ___________________________________1. **M. glaberrima** Radlk.
Leaflets serrate______________________2. **M. scrobiculata** (H. B. K.) Radlk.

The plants are shrubs or small trees with pinnate leaves having few, mostly oblong leaflets, commonly obtuse or rounded at apex, coriaceous, and nearly glabrous. The small whitish flowers are in panicled racemes; the fruit is a small

3-lobed capsule. Both species are common on the Pacific slope. *M. scrobiculata* is called "baralazo" on Taboga Island, and the same name is reported for *M. glaberrima.*

9. SAPINDUS L. Soapberry

The only Central American species is *S. saponaria* L., a widely distributed tree, extending northward to the United States. Only a few trees have been noted about the zone, and it may well be that they have been imported. The soapberry is a small or medium-sized tree with pinnate leaves, having 5 to 15 ovate or oblong, asymmetric, entire leaflets. The small white flowers are borne in large terminal panicles. The fruit is globose, 1-seeded, about 1.5 cm. in diameter, with translucent pulp. At the base of the fruit there is a disklike appendage, representing the abortive second cell of the ovary. Near Panama City I was given the name "limoncillo" for the tree, but usually in Central America and Mexico it is called "jaboncillo."

The fruits, containing about 30 per cent of saponin, when macerated in water produce copious suds, and they are used as a substitute for soap in washing clothes. The large hard seeds are strung into necklaces, and it is said they have been used as buttons. It is reported that the fruit is employed as a fish poison. The light brown, heavy wood is little used except for fuel.

10. TALISIA Aubl.

Talisia nervosa Radlk., endemic in Panama, is frequent in the Atlantic forests. It is a large shrub or small tree with few branches and with pinnate leaves having several pairs of lance-oblong entire glabrous leaflets 30 to 50 cm. long. The petiolules are much swollen on the lower side. The small white flowers are borne in large panicles. The oval indehiscent brown fruit is 2.5 cm. long.

Another species of *Talisia* is known from Panama.

11. MELICOCCUS Jacq. Mamon

Melicoccus bijugatus Jacq., native of South America but grown in Central America for its fruit, is planted on Taboga, and there are trees growing without cultivation about Balboa. It is a good-sized tree, often 20 meters high, with odd-pinnate leaves having 2 pairs of elliptic-oblong entire glabrous leaves and winged petioles. The small, whitish, very fragrant flowers are arranged in terminal racemes. The fruit is 1-seeded, subglobose, 2 to 4 cm. in diameter, with a thick green skin and pleasantly acid, white pulp. The fruit is highly esteemed in some regions. In Panama the tree is called "mamón;" in Cuba and Colombia it is known also as "mamoncillo."

83. RHAMNACEAE. Buckthorn Family

Plants with tendrils, scandent; ovary inferior; fruit with broad longitudinal wings; leaves crenate; flowers in long racemes.................. 1. **GOUANIA.**
Plants without tendrils, erect; ovary superior; fruit not winged; leaves entire; flowers in axillary cymes or clusters........................ 2. **COLUBRINA.**

The Rhamnaceae are trees or shrubs with simple, usually stipulate leaves. The flowers are small and greenish, with a 4 or 5-lobate calyx, 4 or 5 small petals, and 4 or 5 stamens opposite the petals.

1. GOUANIA Jacq.

Leaves densely pubescent beneath............1. **G. polygama** (Jacq.) Urban.

Leaves glabrous beneath or pubescent along the nerves.
2. **G. lupuloides** (L.) Urban.

These plants are large vines or arching shrubs, with ovate or elliptic, short-petioled leaves.

G. polygama (pl. 46) is very common here, and is widely distributed in tropical America. In Panama and Salvador it is called "jaboncillo." As in the other species, the stems macerated in water produce lather, hence they are frequently used for washing clothes. *G. lupuloides* also is of frequent occurrence. In Cuba it is called "jaboncillo"; in Nicaragua "rabo de mono." In the British West Indies the plant is called "chewstick," and the stems are chewed to heal and harden the gums and cleanse the teeth. The dried branches have been employed in Europe for making dentifrices. The bitter stems were formerly used in Jamaica as a substitute for hops in brewing beer.

2. COLUBRINA Rich.

Plants armed with spines; flowers clustered in the axils of the leaves; leaves mostly obtuse and 4 to 6 cm. long....1. **C. heteroneura** (Griseb.) Standl.

Plants unarmed; flowers in peduncled cymes; leaves mostly acuminate and 9 to 15 cm. long....................................2. **C. rufa** Reissek.

The Colubrinas are shrubs or small trees with oblong-ovate to elliptic leaves having 2 glands near the base of the blade. The small flowers are greenish; the fruit is a small subglobose 3-celled capsule.

C. heteroneura, common about the zone, is a shrub or a tree as much as 7 meters high. In Salvador it is called "espino santo"; in Sinaloa "aleznilla." *C. rufa* is a shrub or tree of 4.5 to 9 meters, occasional in forests.

84. VITACEAE. Grape Family

Petals united, falling away as a cap; leaves floccose-tomentose beneath. Leaves simple, broadly cordate.......................................1. **VITIS.**

Petals distinct; leaves not tomentose beneath......................2. **CISSUS.**

The members of the family are woody vines with tendrils and alternate petioled leaves. The small flowers, panicled or cymose, have a 4 or 5-toothed calyx, 4 or 5 distinct or coherent petals, and 4 or 5 stamens opposite the petals. The fruit is a berry and usually 2-celled.

1. VITIS L. GRAPE

The only grape native in Central America is *V. tiliaefolia* Humb. & Bonpl., a species widely dispersed in tropical America and common in thickets about the zone. The fruit, 6 to 8 mm. in diameter and very sour, is of little use, but vinegar is sometimes made from it. From a section of the stem a large amount of watery sap may be obtained, which is sometimes drunk when water is not at hand. In Panama the wild grape is called "uva," the ordinary Spanish term for grape. It is known in Panama also as "bejuco de agua;" in Salvador it is called "uva montés" and "uvilla;" in Mexico, "pichol;" in Costa Rica, "agrá." The Spanish term for a grape vine is "parra" or "vid."

The European grape, *V. vinifera* L., is planted occasionally in Central America, but seldom thrives.

2. CISSUS L.

Leaves simple, broadly ovate, rounded to deeply cordate at base, serrate; flowers green... 1. **C. sicyoides** L.
Leaves 3-foliolate; flowers red.
  Leaflets glabrous or nearly so, mostly obtuse or rounded at apex.
2. **C. salutaris** H. B. K.
  Leaflets villous, at least beneath, acuminate.......... 3. **C. rhombifolia** Vahl.

The species of *Cissus* are woody vines with usually very fleshy leaves. The flowers are in cymes, and the berries small, 1 to 4-seeded, and inedible.

C. sicyoides, rockrope, a common and widely distributed plant of Central America, is abundant here. The inflorescence is often attacked by a smut, *Mycosyrinx cissi*, and becomes so modified that it is hard to recognize it as a part of the normal plant. Indeed, such an inflorescence was once described by Presl as a new genus of flowering plants. The tough stems are employed as a substitute for rope, and in Costa Rica baskets have been made from them. The fleshy leaves have an acid flavor. Macerated in water they give a lather like that produced by soap, and they are sometimes employed for washing clothes. The blackish fruit is said to yield a blue dye. The juice in contact with the skin is reported to cause irritation or even blisters, but I have never seen this demonstrated. In Salvador, Guatemala, and Honduras the vine is called "comemano;" in Costa Rica, "iasú;" in Mexico, "hierba del buey," "tripa de zopilote," "bejuco loco," and "tripas de Judas;" in Colombia, "bejuco castro" and "bejuco chirriador;" in Porto Rico and the Dominican Republic, "caro."

C. salutaris, common about the zone, has bright red, rather handsome flowers. In Guatemala this species is called "coralillo." *C. rhombifolia* is of less frequent occurrence. It is called in Salvador "comemano" and "uva cimarrona;" in Mexico, "tripas de zopilote."

85. ELAEOCARPACEAE. Elaeocarpus Family

Fruit baccate; petals present; leaves dentate, white-tomentose beneath.
1. **MUNTINGIA.**
Fruit capsular; petals none; leaves entire, glabrous............. 2. **SLOANEA.**

The Elaeocarpaceae are trees with alternate stipulate short-petioled leaves. The flowers are perfect and 4 or 5-parted, with numerous stamens.

1. MUNTINGIA L.

The genus consists of a single species, *M. calabura* L., widely distributed in tropical America and plentiful about the zone. It is a tree of 4 to 8 meters with rather conspicuous, axillary, white flowers. The leaves are lance-oblong, very oblique at base, and 3-nerved. The fruit, a globose, green or red berry, about 1 cm. in diameter, containing very numerous small seeds and extremely sweet flesh, is eaten, especially by children. The tough fiber of the bark is employed in some regions for making rope. In Panama the tree is called "pasito;" in Central America and Mexico it is known generally as "capulín."

2. SLOANEA L.

Sloanea quadrivalvis Seem. is a medium-sized tree of frequent occurrence about the zone. The leaves are oblong, rounded at apex; the flowers in 3-flowered axillary corymbs near the ends of the branches. The capsules, about 1.5 cm. long, are densely covered with short, easily detachable bristles that are a menace to the eyes and cause intense irritation if they penetrate the skin. In Panama, Costa Rica, and Salvador the tree is known as "terciopelo" (velvet, in allusion to the covering of the capsules), and the name "casaco" was given for it at Juan Díaz. In Nayarit, Mexico, the tree is called "huesillo."

One other species, *S. megaphylla* Pittier, is known from Panama.

86. TILIACEAE. Linden Family

Fruit furnished with spines or bristles.
  Fruit 6 to 10 cm. in diameter, depressed; anthers linear. Trees. **1. APEIBA.**
  Fruit mostly 1 cm. or less in diameter, not depressed; anthers short.
    Fruit compressed, bristly along the margin, dehiscent; trees. **2. HELIOCARPUS.**
    Fruit globose, covered on all sides with spines, indehiscent; shrubs. **3. TRIUMFETTA.**
Fruit neither spiny nor bristly.
  Fruit linear; pubescence mostly of simple hairs; herbs or shrubs. **4. CORCHORUS.**
  Fruit not linear; pubescence of stellate hairs; mostly trees.
    Fruit compressed, 2-celled; petals violet.................. **5. BELOTIA.**
    Fruit terete or 5-angled, 5-celled; petals white.............. **6. LUEHEA.**

One other genus is represented in Panama. The leaves are alternate, simple, stipulate, the pubescence usually of branched hairs, and the perfect flowers have 5 free or coherent sepals, normally 5 petals, and usually numerous stamens.

1. APEIBA Aubl.

Leaves stellate-tomentose, conspicuously cordate at base, finely dentate. **1. A. tibourbou** Aubl.
Leaves glabrate above, minutely and densely tomentose beneath, usually rounded at base, entire or nearly so.......................... **2. A. aspera** Aubl.

These are the only North American species. They are trees with short-petioled, 3 or 5-nerved, oblong to ovate, acuminate leaves. The large flowers, in few-flowered cymes, have yellow petals. The fruits are very curious, depressed-globose, 6 to 10 cm. in diameter, and covered with hundreds of flexible spines. In appearance they suggest a sea urchin. The fruits of *A. tibourbou* are larger than those of *A. aspera* and have more numerous, longer, and softer spines.

A. tibourbou is one of the common trees of the zone, growing in swamps and on dry hillsides, and often reaching a height of 12 meters. The wood is white, light, and soft. The tough bark fiber is sometimes used for making rope. In Panama the tree is called "cortezo" and "cortez." In most parts of Central America it is called "peine de mico" (monkey comb); in Nicaragua "burillo;" in Colombia "erizo" and "malagano."

A. aspera (pl. 47) is frequent in the forests of the Atlantic slope.

2. HELIOCARPUS L.

Heliocarpus popayanensis H. B. K. is a common tree of the Atlantic slope, sometimes attaining a height of 30 meters. The long-petioled leaves are rounded-ovate, dentate and often lobed, and finely stellate-pubescent beneath. The cymes of pale yellow flowers are not conspicuous. The small fruit is surrounded by a series of long hairy bristles. The light and soft wood is of little value. The local name is "majagüillo."

Other species of *Heliocarpus* are known from Panama.

3. TRIUMFETTA L.

Petals present, yellow; fruit (with its spines) about 10 mm. wide; branches hirsute..**1. T. hispida** A. Rich.

Petals none; fruit 4 mm. wide; branches stellate-tomentose....**2. T. lappula L.**

One or more additional species occur in Panama. The plants are shrubs with long-petioled dentate leaves which are stellate-pubescent and often shallowly lobed. The flowers are small and inconspicuous, the fruit a small hard indehiscent bur covered with stiff spines.

Both species are abundant about the zone. They are called "cadillo" and "cepa de caballo." The former name means merely "bur" and is applied in Panama to all burlike fruits. In other parts of Central America the word "mozote" is more common for burlike fruits. The names "guácimo baboso" and "pega-pega" have been reported as applied in Panama to *T. lappula*, a species known in Salvador as "mozote de caballo" and "mozotillo."

The fruits adhere by their spines tenaciously to clothing. Use is made of them in Salvador during Holy Week, when there is current a custom called "mariposeo." During the concerts in the parks the young men carry quantities of colored paper butterflies, to the back of which one of these burs is glued. Meeting a young lady whom they know or admire, one of the butterflies is pressed upon her dress, as close as possible to her heart, and there it clings by the bur until removed.

The stems of these shrubs contain a tough fiber, also an astringent mucilage. The latter is sometimes used to clarify sirup, and in Costa Rica it is employed as a remedy for colds. In Panama the plants are used as a remedy for diseases of horses.

4. CORCHORUS L.

Capsule blunt; plants usually woody........................**1. C. siliquosus L.**

Capsule acuminate; plants herbaceous.

Leaves long-acuminate; capsule glabrous or nearly so.
2. C. orinocensis H. B. K.

Leaves mostly obtuse; capsule usually hirsute................**3. C. hirtus L.**

The pubescence in this genus is mostly of simple hairs. The leaves are serrate, and the small yellow flowers solitary or clustered in the leaf axils. The linear pod is 2 to 5-celled, with many small seeds.

C. siliquosus is a common weed, called here "escobilla" and in Salvador "té de perla" and "té del monte." *C. orinocensis* likewise is common, and *C. hirtus* has been collected in Balboa.

Two Old World species, *C. capsularis* L. and *C. olitorius* L., furnish the jute fiber of commerce.

5. BELOTIA A. Rich.

Belotia panamensis Pittier (of which *B. macrantha* Sprague is a synonym), endemic in Panama, is frequent in forests about the zone, and there are some handsome trees on Ancón Hill. It is a tree of 6 to 12 meters with short-petioled, oblong-lanceolate, long-acuminate, finely serrate, 3-nerved leaves, stellate-pubescent beneath. The flowers, in small cymes, are about 3 cm. broad, with violet petals and pink sepals. The capsule is 2-celled, compressed, broadly obcordate, over 2 cm. wide, containing numerous hairy seeds. When in flower the tree is showy and very beautiful.

6. LUEHEA Willd.

Leaves covered beneath with a close brown tomentum, finely serrate; calyx about 1 cm. long; fruit 2 to 2.5 cm. long, deeply 5-lobed.
1. L. seemannii Triana & Planch.

Leaves whitish-tomentose beneath with brown nerves, usually coarsely serrate; calyx 2.5 to 3 cm. long; fruit about 4 cm. long, subterete. 2. **L. speciosa** Willd.

The Lueheas are trees with short-petioled, oblong to elliptic, 3-nerved leaves, large, white, very showy flowers, and a woody 5-celled capsule.

L. seemannii, common in forests, is one of the giant trees of the Central American lowlands. In Panama and Costa Rica it is known as "guácimo," and in Honduras as "yayo." *L. speciosa* also is frequent, and is planted as a shade tree in Balboa and elsewhere. Although usually a large tree, often it flowers when only a shrub. In Panama it is called "guácimo;" in Salvador "cabo de hacha," "bonete," and "tepecaulote;" in Tabasco "pataxtillo;" in Colombia "tablón."

87. MALVACEAE. Mallow Family

Fruit a capsule, the cells dehiscent on the outer side, not separating from each other at maturity. Calyx subtended by bractlets.

Bractlets at base of calyx 3, cordate ____ 12. **GOSSYPIUM.**

Bractlets 5 or more.

Cells of the fruit 1-seeded ____ 13. **KOSTELETZYKA.**

Cells containing 2 or more seeds.

Styles distinct. Herbs, shrubs, or trees ____ 14. **HIBISCUS.**

Styles united. Cultivated tree ____ 15. **THESPESIA.**

Fruit not capsular, composed of few or numerous carpels, these separating from each other at maturity.

Style branches as many as the carpels of the fruit.

Seeds 2 to many in each carpel.

Carpels 1-celled; petals white ____ 1. **GAYOIDES.**

Carpels 2-celled, often imperfectly so; petals yellow.

Inflorescence openly paniculate; carpels incompletely 2-celled. 2. **WISSADULA.**

Inflorescence spikelike; carpels completely 2-celled. 3. **PSEUDABUTILON.**

Seeds 1 in each carpel.

Corolla blue or purple. Annual herb ____ 4. **ANODA.**

Corolla yellow, white, or reddish.

Seeds ascending; pubescence of closely appressed, 4-rayed hairs. 5. **MALVASTRUM.**

Seeds pendulous; pubescence mostly of spreading hairs, these simple or with more than 4 branches.

Calyx subtended by 6 to 8 bractlets ____ 6. **SIDASTRUM.**

Calyx naked ____ 7. **SIDA.**

Style branches twice as many as the carpels.

Carpels covered with numerous short spines ____ 8. **URENA.**

Carpels with 1 to 3 large spines, or unarmed.

Corolla bright red; fruit fleshy ____ 9. **MALVAVISCUS.**

Corolla not red; fruit dry or nearly so.

Bractlets none or irregularly mixed among the flowers; flowers capitate, the heads subtended by leaflike bracts. Plants stellate-hispid; fruit not spiny ____ 10. **MALACHRA.**

Bractlets present at base of calyx in a complete circle; flowers usually not capitate; fruit often spiny ____ 11. **PAVONIA.**

The genus *Abutilon* has been reported from the region, but it has not been found here recently. The Malvaceae are herbs, shrubs, or small trees with alternate leaves and small, usually deciduous stipules. The flowers are regular, perfect, often large and showy, with 5 more or less united sepals and 5 petals.

The stamens are united by their filaments into a column about the pistil, and the styles are united below. The plants of the family usually have mucilaginous sap and very tough bark fiber.

1. GAYOIDES Small

Gayoides crispum (L.) Small (*Abutilon crispum* Sweet), occasional on the Pacific slope, is an ascending or decumbent herb with ovate-cordate, velvety-tomentose leaves and small white axillary flowers. In Salvador it is called "hierba del toro."

2. WISSADULA Medik

Leaves finely whitish-tomentose beneath, minutely stellate-tomentose above, mostly narrow-triangular..............1. **W. periplocifolia** (L.) Presl.
Leaves brown-tomentose beneath, glabrate above, ovate.
2. **W. excelsior** (Cav.) Presl.

The plants are large bushy herbs with long-petioled entire leaves and small, pale yellow or buff flowers in terminal panicles. *W. periplocifolia* is common on the Pacific slope, and *W. excelsior* is frequent on both watersheds.

3. PSEUDABUTILON R. E. Fries

Pseudabutilon spicatum (H. B. K.) R. E. Fries has been collected near Gamboa. It is a shrub of 2 meters with rounded-cordate acuminate entire leaves, and small yellow flowers in long terminal spikelike panicles.

4. ANODA Cav.

Anoda cristata (L.) Schlecht. has been collected at Frijoles, perhaps only as a waif. The species is widely distributed in tropical America. It is an annual with entire or lobed, nearly glabrous leaves and long-peduncled, axillary, dark purple or blue, showy flowers. The fruit consists of 9 to 15 hispid carpels. In Salvador the plant is called "malva"; in Guatemala "malvilla" and "violeta."

5. MALVASTRUM A. Gray

Malvastrum coromandelianum (L.) Garcke, of infrequent occurrence on the Pacific slope, is a weedy herb with oblong to ovate, toothed leaves and axillary yellow flowers. The pubescence is peculiar, consisting of closely appressed hairs that are 4-rayed, the rays in opposite pairs. In Panama the plant is called "escobilla."

6. SIDASTRUM E. G. Baker

The genus consists of a single species, *S. quinquenervium* (Duchass.) E. G. Baker. This was described from Panama, and specimens from Venezuela and Brazil were considered by Baker as probably conspecific. The plant has been collected recently near Gatún. It is a coarse herb about a meter high with stellate-hirtellous short-petioled lance-oblong leaves, the rather showy, yellow flowers in dense axillary clusters and in terminal spikes.

7. SIDA L.

Leaves lance-ovate to rounded-ovate, cordate at base.
  Flowers sessile or nearly so in dense clusters.
    Calyx terete, finely stellate-pubescent........1. **S. pyramidata** Desportes.
    Calyx 5-angled, hirsute.
      Leaves stellate-hirsute..................................2. **S. urens** L.
      Leaves densely and finely velvety-tomentose....3. **S. aggregata** Presl.

Flowers long-pedicellate, mostly solitary.
  Plants prostrate; leaves very unequal at base
 4. S. decumbens St. Hil. & Naud.
  Plants erect; leaves with equal basal lobes.
   Plants glandular-pubescent; calyx angled-----**5. S. glutinosa** Commers.
   Plants without glandular pubescence; calyx terete--**6. S. paniculata** L.
Leaves linear to ovate or obovate, not cordate at base.
 Flowers mostly in terminal long-stalked cymes; leaves entire, elongate-linear.
 7. S. linifolia Juss.
 Flowers all axillary, or in terminal sessile clusters; leaves toothed.
  Flowers adnate to the petioles of leaflike bracts, clustered at the ends of the branches; petals salmon-red. Plants usually less than 30 cm. high.
 8. S. ciliaris L.
  Flowers not adnate to the petioles of bracts, solitary or clustered in the leaf axils; petals yellow, buff, or white.
   Leaves green beneath, glabrate or hirsute, distichous.
    Carpels of the fruit usually 5; stipules mostly 5-nerved.
 9. S. glomerata Cav.
    Carpels usually 7 or more; stipules 3-nerved-----**10. S. acuta** Burm.
   Leaves pale beneath, densely and minutely velvety-tomentose, not distichous.
    Carpels 7 to 12---------------------------**11. S. rhombifolia** L.
    Carpels usually 5.
     Leaves ovate or elliptic; petals white-------**12. S. jamaicensis** L.
     Leaves linear-oblong or linear-lanceolate; petals buff.
 13. S. spinosa L.

The Sidas are herbs or small shrubs, with mostly small and unattractive flowers.

S. pyramidata, of rather infrequent occurrence, is usually 1 to 2.5 meters high and has pale yellow flowers. In Salvador it is called "malvita" and "escobilla blanca." *S. urens* is a common weed with buff flowers. The hairs of the foliage are sufficiently stiff to penetrate the skin. *S. aggregata* is a shrub, of infrequent occurrence, on the Pacific slope. The corolla is buff with a red eye. *S. decumbens* occurs on the Pacific watershed, and *S. glutinosa* is a frequent weed, very sticky when handled. *S. paniculata* was reported from Empire by Hemsley, but has not been found here recently. *S. linifolia* grows in grassland on the Pacific slope. In Salvador this species is called "lengua de pájaro." *S. ciliaris* seems to be confined to the savannas.

S. glomerata is an occasional weed, called here "escobilla." This name is used throughout Central America for plants of similar appearance, and alludes to the fact that the tough branches are often used for rough brooms. *S. acuta* is one of the most abundant weeds of tropical America. The flowers vary from white to buff. In Panama as elsewhere the plant is called "escobilla"; by the West Indians it is known as "broomweed" or "broom." It is eaten to some extent by stock. The tough fiber of the stems has been employed for making cordage.

S. rhombifolia, probably the most common weed of Central America, is widely distributed in the tropics of both hemispheres. It is especially abundant in pastures, and it is perhaps for that reason that in the writer's mind it is always associated with ticks. Escobilla, as it is called almost everywhere, is a plant to be avoided if one does not like ticks. The name "hierba de puerco" was given for the plant by one Panamanian. The leaves are said to be used sometimes in Mexico as a substitute for Chinese tea.

S. jamaicensis has been found only at Bella Vista. *S. spinosa* is of frequent occurrence on the Pacific slope, especially in the savannas. Like the other related species, it is known here as "escobilla."

8. URENA L.

Leaves merely angulate or serrate .... **1. U. lobata L**
Leaves deeply palmate-lobed .... **2. U. sinuata L.**

No other species are known from Central America. The plants are large herbs or shrubs with broad, long-petioled, stellate-pubescent leaves, and small but rather showy, pink or purple flowers, mostly solitary in the leaf axils. The 5-celled fruit is covered with stiff spines that are barbed at the tip and adhere to clothing.

Both species are common here, but *U. lobata* is almost confined to the Atlantic slope and *U. sinuata* to the Pacific slope. *U. sinuata* is known here as "cepa de caballo"; in Salvador it is called "malvita."

9. MALVAVISCUS Cav.

Malvaviscus populifolius Presl grows on Taboga Island. It is a shrub with ovate or rounded-ovate, toothed and sometimes lobed, stellate-pubescent leaves, and bright red flowers about 4 cm. long. The globose, red, and fleshy fruit is sometimes eaten, but is insipid. On Taboga the plant is called "papito de monte"; in Salvador "manzanita," "manzanilla," and "flor de arito."

One other species is known from the mountains of Panama. Some of the species are cultivated in hothouses in the North.

10. MALACHRA L.

Petals pink or purple; calyx surrounded by an involucel of subulate bractlets; leaves 3 or 5-lobed nearly to the base .... **1. M. radiata L.**
Petals white or yellow; calyx without an involucel; leaves shallowly or not at all lobed.
  Petals white; leaves mostly 3 or 5-lobed .... **2. M. fasciata Jacq.**
  Petals yellow; leaves not lobed .... **3. M. alceifolia Jacq.**

The Malachras are coarse herbs, usually stellate-hispid, with long-petioled leaves. The rather large flowers are in axillary or terminal heads, subtended by heart-shaped green bracts. The fruit consists of 5 obtuse reticulate carpels.

M. radiata has been collected near Matías Hernández. *M. fasciata* and *M. alceifolia* are common weeds. The stiff hairs of the stems penetrate the skin readily. *M. fasciata* is called here "borraja" and "malva macho," and *M. alceifolia* is known as "malva."

11. PAVONIA Cav.

Bracts subtending the flowers large, leaflike, cordate or broadly ovate. Flowers yellow.
  Leaves 7-nerved, rounded-ovate, obtuse, velvety-tomentose; carpels of the fruit glabrous .... **1. P. sessiliflora** H. B. K.
  Leaves 3 or 5-nerved, ovate or oblong-ovate, acute or acuminate, with sparse rough pubescence; carpels pubescent .... **2. P. preslii** Standl.
Bracts small and inconspicuous.
  Carpels each bearing 1 to 3 barbed spines on the back; leaves pinnate-nerved.
    Petals pink; bractlets 8 to 12, linear .... **3. P. rosea** Schlecht.
    Petals white; bractlets 5 or 6, ovate or lanceolate.
      4. P. fruticosa (Mill.) Fawc. & Rendle.

Carpels without spines; leaves 3-nerved or palmately several-nerved.
  Leaves 3-nerved; flowers white, solitary in the leaf axils. **5. P. panamensis** Standl.
  Leaves palmately 5 or 7-nerved; flowers not white, in racemes or panicles.
    Bractlets at base of calyx 5 or 6; leaves subentire, glabrate. Shrub with naked racemes of bronze or yellowish flowers___**6. P. spicata** Cav.
    Bractlets 8 to many; leaves toothed and often lobed, copiously pubescent.
      Petals yellow, about 1.5 cm. long; fruit dry_____**7. P. paniculata** Cav.
      Petals pink, 4 to 6 cm. long; fruit mucilaginous__**8. P. dasypetala** Turcz.

Other species are known from Panama. The name *Malache* is sometimes used for the genus. The plants are herbs or shrubs, often with showy flowers, the fruit consisting of 5 carpels.

P. sessiliflora is a common shrub or herb of the Pacific slope. It is called "guacimillo," and the name "friega-plato" is reported for it. *P. preslii*, very similar in general appearance, is frequent on the Atlantic slope. Both these species often grow in water.

P. rosea, one of the common weeds of Central America, is called "mozote" in Guatemala. *P. fruticosa* is frequent about the zone. Both these species are herbs or small shrubs with inconspicuous flowers. The barbed spines of the fruit adhere tenaciously to clothing, and also penetrate the flesh with ease.

P. panamensis is a slender herb or shrub, occasional on the Pacific slope, and *P. spicata* occurs in mangrove swamps on the Atlantic coast. *P. paniculata* is a large coarse herb, frequent in woods and thickets. *P. dasypetala*, a shrub of 1 to 5 meters with handsome flowers, is found rather sparingly in the Atlantic forests.

12. GOSSYPIUM L. COTTON

Gossypium mexicanum Todaro is a frequent shrub about the zone, in thickets and along roadsides. It may be native, or perhaps it has been introduced from Mexico. It is the common wild cotton of Central America.

Little cotton is grown at present in Panama, and scarcely any about the zone. The plant was well known to the aboriginal inhabitants, who employed the fiber for weaving cloth. The Spanish word for cotton is "algodón."

13. KOSTELETZKYA Presl

Kosteletzkya sagittata Presl grows in marshes and wet fields on the Pacific slope. It is a coarse herb or shrub 1 to 3 meters high with sagittate leaves, the small white flowers arranged in long narrow panicles.

14. HIBISCUS L.

Bractlets subtending the calyx dilated at apex and often forked.
  Bractlets with a broadly dilated, reniform apex_________**1. H. sororius** L. f.
  Bractlets forked at apex, with 2 acute lobes.
    Stems with numerous spinelike prickles. Leaves usually 3-lobed; petals 7 to 9 cm. long______________________________**2. H. bifurcatus** Cav.
    Stems not prickly.
      Leaves green and nearly glabrous beneath_______**3. H. cannabinus** L.
      Leaves pale beneath, densely stellate-tomentose. **4. H. furcellatus** Lam.
Bractlets narrow at apex, never dilated or forked.
  Leaves entire, finely white-tomentose beneath___________**5. H. tiliaceus** L.
  Leaves toothed and often lobed, green beneath.
    Stems and lower surface of leaves prickly_____________**6. H. ferox** Hook.

Stems and leaves not prickly.
Petals yellow; calyx spathelike, deciduous.
Stems hirsute; fruit 6 to 8 cm. long, hirsute---7. **H. abelmoschus** L.
Stems glabrate; fruit 10 to 20 cm. long, short-villous. 8. **H. esculentus** L.
Petals usually pink or purple; calyx with 5 lobes or teeth, persistent.
Bractlets spatulate or oblanceolate. Plants stellate-hispid; leaves angled------------------------------9. **H. spathulatus** Garcke.
Bractlets linear.
Leaves cut nearly to the base into 3 narrow lobes; calyx red and very fleshy; stems herbaceous---------------10. **H. sabdariffa** L.
Leaves merely toothed, with shallow broad lobes; calyx herbaceous, green; stems woody.
Petals about 2.5 cm. long; stamen column not exserted. 11. **H. brasiliensis** L.
Petals 6 to 15 cm. long; stamen column long-exserted.
Petals deeply laciniate-lobed; flowers pendent. 12. **H. schizopetalus** (Mart.) Hook.
Petals not lobed; flowers erect-------13. **H. rosa-sinensis** L.

One or more additional species are known from Panama. The plants are herbs, shrubs, or small trees, usually with showy flowers, the calyx subtended by few or numerous bractlets. The fruit is a 5-celled capsule, with glabrous or hairy seeds.

H. sororius, a coarse herb with showy white flowers which turn pink in fading, grows in shallow water on the Atlantic slope. *H. bifurcatus*, which has been collected at Agua Clara, is suffrutescent, 1 to 4 meters high, with showy rose-pink flowers. Its local name is "algodoncito," and in Mexico this species is called "flor de paisto" and "mala mujer." *H. cannabinus*, sometimes grown for ornament, is a native of the East Indies. *H. furcellatus* has been collected along the Chiva-chiva Trail.

H. tiliaceus, a common shrub or small tree of mangrove swamps, is widely distributed in the tropics. The large leaves are rounded, and deeply cordate at base, the showy flowers yellow, with petals 4 to 7 cm. long. The wood is whitish or purplish, light and soft but firm, easy to work, taking a high polish, and durable. The tough fiber of the bark was formerly an important source of cordage, and it is still used to some extent. In Guam oiled ropes made of it are employed as cables. The fiber is employed by some of the aborigines for weaving mats and coarse cloth, and in the Pacific islands the bark was eaten in times of famine. In Panama the tree is called "majagua," a term perhaps of Carib origin and widely employed in America. This in English is sometimes corrupted into "mahoe."

H. ferox, a shrub or small tree ranging from Costa Rica to Colombia, has been collected at Alhajuela. The leaves are round-cordate and as much as 40 cm. broad, the flowers bright yellow.

H. abelmoschus, a native of the East Indies, which is sometimes grown for its showy flowers and for the musk-scented seeds, occurs wild in numerous places about the zone. The bright yellow flowers, 8 to 10 cm. broad, are very handsome. The West Indians call the plant "wild okra"; in Salvador it is called "almizcle"; in Porto Rico "algalía."

H. esculentus is the okra, brought from Africa to the New World at an early date, probably by negro slaves, and now one of the common vegetables of Central America, especially in those regions settled by negroes. About the zone the okra is often found wild about old clearings. The local name is "ñajú." In Salvador the plant is called "gombo"; in Mexico "chimbombo" and "quingombo." The seeds are sometimes employed in Panama as a coffee substitute.

H. spathulatus, a coarse herb with pink flowers, occurs sparingly on the Atlantic slope.

H. sabdariffa, roselle or "Jamica sorrel," native of the East Indies, is grown in large quantities in Panama, especially by the West Indians. So much of the plant is seen in the markets and on the roads that one would think the market oversupplied. It is a glabrous herb, usually 1 to 2 meters high, with red stems and pink flowers. The juicy acid calyces are used for making cool drinks; also for jelly and jam. The local name is "viñuela," and the West Indians call the plant "sorrel." In Porto Rico it is known as "viña"; in Mexico as "Jamaica." The plant is found wild in some places about the zone.

H. brasiliensis, reported from Taboga Island by Hemsley, has not been collected there recently. It is a common species of the Pacific coast of Central America, called "mañanitas" in Salvador and "mírame linda" in Nicaragua.

H. schizopetalus, a shrub native in tropical Africa, in general appearance is like the common hibiscus, but the flowers are very different. They are very graceful and handsome. About the zone this species is seldom planted. The shrub is called here "paragüita china" (Chinese parasol); in Salvador "clavel" or "clavel de canastilla"; in Nicaragua "avispilla de canastilla"; in Colombia "araña"; and in Porto Rico "lira."

H. rosa-sinensis is the common Chinese hibiscus, native of China but grown everywhere in the Tropics and abundantly planted about the zone, especially for hedges. The flowers are single or double, and exhibit great variation in color. In India the hibiscus is sometimes called "shoeflower plant." The petals turn black when crushed, and are utilized for blacking shoes, and Chinese women use the flowers to dye the hair and eyebrows. The flowers are sometimes pickled and eaten in China, and are used to color spiritous liquors. The petals impart to paper a bluish tint that reacts like litmus. In Panama the hibiscus is called "papo," "tapo," and "papo de la reina"; in Guatemala and Salvador "clavel," "clavel japonés," and "clavelón"; in Honduras and Cuba "mar pacífico"; in Colombia "resuscitado" and "escandalosa roja"; in Mexico "tulipán," "rosa china," "obelisco," and "gallardete"; in Porto Rico "amapola" and "pavona."

15. THESPESIA Soland.

Thespesia populnea (L.) Soland., planted frequently as a shade tree, is a native of the West Indies and South America. It is a tree with long-petioled entire heart-shaped leaves, nearly glabrous but with a few scurflike scales. The flowers are axillary, the yellow petals 4 to 7 cm. long, with purple base, turning purple in age. The fruit is a leathery depressed capsule 3 to 4.5 cm. broad. In Porto Rico the tree is called "emajagüilla," "Santa María," and "palo de jaqueca."

88. BOMBACACEAE. Cottontree Family

Leaves digitately compound.
  Seeds 1.5 cm. long or larger; flowers mostly 20 to 30 cm. long; stamen fascicles repeatedly branched ---------- **1. PACHIRA.**
  Seeds 6 mm. or less in diameter; flowers usually less than 15 cm. long; stamen fascicles dividing into simple filaments.
    Stamen tube short, thick; stamens usually over 1,000 ------- **2. BOMBAX.**
    Stamen tube elongate, slender; stamens fewer than 100. **3. BOMBACOPSIS.**
Leaves simple.
  Stamens in 5 clusters, the filaments free above; fruit with large longitudinal wings ---------- **4. CAVANILLESIA.**

Stamens not in clusters, the filaments united for their whole length; fruit not winged.

Leaves entire, glabrous beneath or nearly so; fruit indehiscent, 1 or 2-seeded; stamen tube cylindric........................... 5. **QUARARIBEA.**

Leaves lobed, tomentose beneath; fruit a 5-celled capsule, many-seeded; stamen tube funnelform........................... 6. **OCHROMA.**

The genera *Ceiba* and *Gyranthera* are represented in Panama. The Bombacaceae are trees with alternate leaves and perfect, usually large flowers, the calyx 5-lobed and the corolla of 5 petals. The stamens are usually numerous, and their filaments united.

1. PACHIRA Aubl. PROVISION-TREE

Leaflets glabrate beneath; fruit twice as long as broad, pointed at apex. **1. P. aquatica** Aubl.

Leaflets stellate-pubescent beneath; fruit less than twice as long as broad, rounded at apex.. **2. P. villosula** Pittier.

P. aquatica is of frequent occurrence on the Atlantic slope, growing in wet forest or in swamps. It is a small or medium-sized tree with smooth trunk and few radiating branches, the leaves with 5 to 7 narrow oblanceolate leaflets which are usually pointed at apex. The large flowers are pinkish, the stamen tube 6 to 11 cm. long. The fruit is russet, 15 to 38 cm. long, very hard and heavy, the brown seeds imbedded in solid white flesh. The trees are often so heavily loaded with the enormous fruits that it is hard to understand how the branches can support such a load. The tree is common all along the Atlantic coast of Central America, especially in swamps. In some localities the large seeds are roasted and eaten like chestnuts and it is reported that in the Guianas the young leaves are cooked and eaten. On the coast of Nicaragua the seeds are called "saba nuts." In Guatemala the tree is called "ceiba" and "sunzapote"; in Honduras "zapotón" and "pumpunjuche"; in Salvador, where it is planted, "shila blanca"; in Mexico "zapote bobo" and "zapote de agua"; in Cuba "ceibón de agua" and "castaño silvestre."

P. villosula is an endemic species, growing in river bottoms about Chepo and probably also nearer the zone. It is a large tree with white or pinkish flowers. The brown fruit is about 18 cm. long and 12 cm. thick. The tree is called "mano de mono" and "fruta de mono." The wood of both these trees is soft, light, and useless.

2. BOMBAX L.

Bombax barrigon (Seem.) Decaisne, frequent about the zone and often planted as a shade tree, is a species restricted to Panama and western Costa Rica. It is a large deciduous tree, often 15 meters high or larger, the trunk green, smooth, and much swollen below, hence the usual name of "barrigón" (big belly). The 7 to 9 leaflets are oblanceolate or obovate, glabrous, and short-pointed. The white flowers are conspicuous because of the dense mass of stamens. The Americans give the flowers the very appropriate name of "powder-puffs," and the Panamanians call them "motas." The seed-pods are oblong, about 18 cm. long, smooth, filled with grayish "cotton," among which are imbedded the many small seeds. In Costa Rica the tree is called "ceibo."

The wood is soft and useless, but the cotton is useful for stuffing pillows and mattresses, being much like that of *Ceiba pentandra* (L.) Gaertn., a widespread tropical tree that occurs in some parts of Panama. The silklike cotton of that tree is known in commerce as "kapok," and large amounts are exported from the East Indies and West Africa, for filling mattresses and life preservers.

3. BOMBACOPSIS Pittier

Trunk unarmed; capsule ovoid, woody; flowers about 15 cm. long. 1. **B. sessilis** (Benth.) Pittier.
Trunk armed with short stout prickles; capsule coriaceous; flowers about 10 cm. long.................................2. **B. fendleri** (Seem.) Pittier.

B. sessilis, sometimes called "ceibo," one of the common trees about the zone, is of small or medium size. It is often planted as a shade tree. The bark is greenish and the crown small, the 5 to 7 leaflets oblong to obovate, rounded or emarginate at apex, and glabrous. The white or pink flowers are very showy. The fruit is filled with brownish cotton.

B. fendleri, also frequent about the zone, in general appearance is much like the preceding species, but is easily distinguished by the very spiny trunk. The fruits are 6 to 7 cm. long. The local name is "cedro espinoso." The light wood is much used for construction purposes. The leaves fall in January and the flowers appear a few weeks later; the pods ripen and fall before the new leaves unfold.

4. CAVANILLESIA Ruiz & Pav. CUIPO

Cavanillesia platanifolia H. B. K. (pl. 48), one of the most remarkable trees of this region, is not found north of the Canal region, but grows in Colombia. It is a stately tree, 20 to 30 meters high with a rather small crown but with a very thick, smooth, pale trunk, usually swollen near the base. The large leaves are shallowly 5 or 7-lobed, nearly glabrous at maturity, and deciduous. The flowers are small, the red petals only 2 cm. long. The body of the fruit is hard and spindle-shaped, the thin wings about 8 cm. broad.

The tree is common about the zone and very conspicuous, especially when in flower, in late March and early April. It is called here "cuipo" and "quipo," in some parts of Panama "bongo" and "hamati," and in Colombia "macondo." The wood is white or yellowish, coarse, soft, and pithlike, extremely light, a cubic foot weighing only 6.25 pounds. No commercial use is made of it, although it has been suggested as a substitute for balsa (*Ochroma*). The trunks are sometimes used by the natives for canoes, and also for floating rafts of hardwood logs.

5. QUARARIBEA Aubl.

Flowers about 12 cm. long; calyx narrowly 10-winged..1. **Q. pterocalyx** Hemsl.
Flowers about 3 cm. long; calyx not winged...........2. **Q. asterolepis** Pittier.

The Quararibeas are small trees with large, oblong to ovate leaves, finely stellate-pubescent beneath. The petals are white, the fruit drupaceous and 2-celled, usually about 6 cm. long. All parts of the plant exhale a strong odor like that of slippery elm, persistent even in dried specimens. Both species are endemic in Panama. *Q. pterocalyx* is frequent in forests of the Atlantic slope. *Q. asterolepis* grows about Chepo and probably comes within our range. It is called "guayabillo."

6. OCHROMA Swartz. BALSA

Ochroma limonensis Rowlee, a common tree about the zone and frequently planted for shade, is a medium-sized tree with open spreading crown of few branches. The large cordate leaves are mostly 3-angled or shallowly 3-lobed, long-stalked, green above but pale beneath and with a dense covering of fine stellate hairs. The large flowers (about 15 cm. long) are whitish. The fruit is a 5-celled pod, about 20 cm. long, filled with brownish cotton and numerous small seeds.

Rowlee has reported two species of *Ochroma* from the Canal Zone, but apparently only one is represented here. Several species have been described from tropical America, but the number of recognizable forms seems to be much smaller. In Panama the tree is called "balsa" or "balso" and "lana," and by the West Indians "cotton-tree." The cotton is used here for stuffing pillows and mattresses.

Balsa trees grow with extreme rapidity, often attaining in 5 or 6 years a height of 16 to 20 meters and a trunk diameter of 60 to 75 cm. The wood is one of the lightest known, weighing 7.5 to 12 lbs. per cubic foot, and being lighter than cork. It is pinkish white or pale reddish, very soft, and spongy. By the Indians it was employed for rafts or *balsas*, hence the common name. Large amounts of balsa wood have been employed in the United States and elsewhere in the manufacture of life preservers and other similar articles, and for insulating refrigerators. In its natural state the wood decays rapidly, but this is overcome by impregnating it with hot paraffin.

89. STERCULIACEAE. Cacao Family

Corolla none; flowers unisexual; fruit of distinct carpels; leaves lobed. **1. STERCULIA.**

Corolla present; flowers perfect; fruit of united carpels or of a single carpel; leaves various, sometimes digitate, but not lobed.
- Stems prickly. Shrub, usually scandent; fruit covered with long spines; leaves entire ---- **2. BUETTNERIA.**
- Stems unarmed.
  - Leaves or leaflets entire; flowers often borne on the naked trunk or branches. **3. THEOBROMA.**
  - Leaves toothed; flowers borne on leafy branches.
    - Petals red; fruit spirally twisted ---- **4. HELICTERES.**
    - Petals not red; fruit not spirally twisted.
      - Petals concave; stamens 15; fruit hard and woody, 2 to 4 cm. long, covered with spinelike tubercles ---- **5. GUAZUMA.**
      - Petals flat; stamens 5; fruit thin-walled.
        - Capsule 1-celled ---- **6. WALTHERIA.**
        - Capsule 5-celled ---- **7. MELOCHIA.**

The Sterculiaceae usually have stellate pubescence. The leaves are alternate, simple or digitate, with stipules. The flowers have a 5-lobed calyx and 5 petals (rarely none), which are free or united with the stamen tube. The stamens are united, at least below, the tube usually bearing 5 staminodia, with the anthers in the sinuses of the lobes of the tube.

1. STERCULIA L.

The Panama tree, *S. apetala* (Jacq.) Karst. (pls. 49, 50), is common about the zone, and is planted for shade. It is a giant tree, sometimes 40 meters high, with thick trunk and a broad dense crown, the long-stalked leaves often 30 to 50 cm. wide, with 3 or 5 broad entire lobes. The leaves are softly stellate-tomentose beneath. The large flowers, borne in axillary panicles, have no petals but the bell-shaped 5-lobed calyx is reddish and woolly outside, and dark red and greenish yellow within. The fruit is a cluster of 5 podlike carpels 10 cm. long, containing large brown chestnutlike seeds. The interior of the pod is covered with stiff bristles that penetrate the flesh easily and cause intense irritation.

This well deserves to be the national tree of Panama, for it is from its Indian name that the name of the Republic is derived. The tree ranges from southern Mexico to the West Indies and northern South America. In Panama it is always known as "Panamá." In Guatemala, Salvador, and Honduras it is called "castaño"; in Tabasco "bellota"; in Colombia "camajón"; in Cuba "camaruca." The seeds, known as "castañas," are edible. The wood is useful for construction purposes.

2. BUETTNERIA L.

Buettneria aculeata Jacq., common in this region, is an arching shrub or often a large vine, the hollow angled stems armed with numerous recurved prickles. The leaves are lanceolate to ovate, entire, glabrous or nearly so, those on young shoots often handsomely blotched with silver. The very small greenish flowers are inconspicuous. The fruit is a small 5-celled capsule covered with long spines. The local names are "espina hueca," "zarza," "rabo de iguana," and "rangay." In Costa Rica the plant is called "uña de gato"; in Salvador and Venezuela "zarza hueca"; in Mexico "gatuño," "arrendador," and "varilla prieta."

3. THEOBROMA L. Cacao

Leaves simple, entire.
  Leaves glabrous beneath or nearly so; flowers borne on the trunk and large naked branches.......................................**1. T. cacao** L.
  Leaves finely white-tomentose beneath; flowers borne on young leafy branches.................................**2. T. bicolor** Humb. & Bonpl.
Leaves digitate, with usually 5 large leaflets..........**3. T. purpureum** Pittier.

Theobroma cacao, the cacao tree from which cacao, cocoa, and chocolate are obtained, is a native of tropical America and is said to grow wild in the forests of Chiriquí and Darién. About the zone it is sometimes found in the forests with the appearance of a native plant, but perhaps it is here only an escape from cultivation. Cacao trees are planted commonly about the zone, and at Las Cascadas Plantation there are said to be 6,000 acres planted with them. This plantation has been neglected and has grown up with weeds and brush, but recently a beginning has been made toward cleaning and restoring it. The American cacao industry has suffered in recent years because of competition from the Old World Tropics.

Cacao was well known to the aboriginal inhabitants of Mexico and Central America, and was cultivated by them in many places. In some regions the tree had a secondary application of importance, the seeds serving as a substitute for coin in business transactions.

T. bicolor, the patashte, has been collected at Caño Quebrado. It is a tree with large oblong leaves, green above and white beneath. The fruit is ellipsoid, about 15 cm. long, with white pulp. The seeds furnish a good quality of cacao, and the tree is cultivated in many parts of Central America. It is usually known as "patashte," but sometimes as "cacao blanco."

Theobroma purpureum (pl. 51) is a common plant in the Atlantic forests, in appearance very unlike the common cacao. It is a large shrub or small tree with long-stalked leaves, the leaflets usually 30 to 50 cm. long. The small flowers are borne on the trunk, as in *T. cacao*. The pods, only 7 cm. long and covered with slender stinging hairs, have a white edible pulp. The seeds are much smaller than in true cacao. This species is called here "cacao cimarrón" and "chocolatillo."

Several other species of *Theobroma* are known from Panama. According to Pittier, three species of cultivated cacao, usually referred to *T. cacao*, may be distinguished, and that planted at Las Cascadas is *T. leiocarpum* Bernouilli with 5-furrowed, nearly smooth fruit.

4. HELICTERES L.

Helicoteres guazumaefolia H. B. K. is one of the most common shrubs of the region. It has oblong or ovate, toothed, 5 or 7-nerved leaves, densely stellate-pubescent beneath, and rather showy, axillary, bright red flowers 2.5 cm. long with erect petals and long-exserted stamens. The fruit is very unlike that of any other Central American plant, being about 3 cm. long, and spirally twisted so as to resemble a screw. The bark contains a tough fiber. The local names are "guacimillo," "majagüillo," and "berbequí santo"; "guácimo torcido" and "torcidillo" are other names reported from Panama. In Salvador the shrub is called "tornillo" and "barreno;" in Costa Rica "rabo de puerco;" in Nicaragua "cola de chancho;" in Guatemala "monecillo."

5. GUAZUMA Adans. Guacimo

One of the most common plants of Central America is *G. ulmifolia* Lam. (pl. 52), which is abundant nearly everywhere about the zone. It is a large shrub or medium-sized tree with oblong to ovate, toothed leaves, very unequal at base, beneath pale and densely stellate-pubescent or sometimes glabrate. The small flowers with pale yellow petals are in axillary cymes. The fruit is an oval woody capsule, 2 to 4 cm. long, densely covered with stout sharp tubercles, and containing numerous seeds. The fruit is at first green, and finally black. When ripe it is pulpy inside, with an agreeable sweet flavor, and is often eaten, although it is a very poor fruit, and the large seeds are objectionable. Stock eat the fruits and browse on the tender branches.

The bark contains a tough fiber that is sometimes twisted into rope. The mucilaginous sap has been used for clarifying sirup in the manufacture of sugar. The wood, light pinkish and rather light but tough and strong, is used locally for construction purposes and for charcoal.

The usual name for the tree in Panama as well as in most other parts of its range is "guácimo." The fruit is called "cabeza de negrito" in Panama, and by the West Indians the tree is called "bastard cedar." Other names are "caulote" (Salvador, Guatemala); "cablote" (Honduras); "guacimillo" (Nicaragua); "tablote," "majagua de toro" (Mexico); and "chicharrón" (Salvador).

6. WALTHERIA L.

Calyx lobes subulate; leaves not reticulate-veined; flower clusters mostly long-stalked; herb; corolla yellow.................... **1. W. americana** L.

Calyx lobes ovate; leaves reticulate-veined; flower clusters mostly sessile; shrub; corolla white.................................. **2. W. glomerata** Presl.

The pubescence is of stellate hairs, the leaves ovate or elliptic and crenate, and the fruit a 1-seeded capsule.

W. americana grows on the Pacific slope but is scarce, although it is a common weed in many parts of tropical America. The local names are "friega-plato" and "mala sombra." In Salvador the plant is called "escobilla" and "hierba del buey"; in Mexico "malva," "hierba del soldado," and "hierba del pasmo"; in Venezuela "bretónica."

W. glomerata is a common shrub about the zone. The leaves are distichous. The vernacular name is "palo del soldado."

7. MELOCHIA L.

Capsule pyramidal; calyx much enlarged in fruit; corolla usually pure white.
1. M. lupulina Swartz.

Capsule depressed; calyx not enlarged in fruit; corolla pink or purple.

Flower clusters mostly in terminal naked spikes; corolla much exceeding the calyx, bright purple-------------------------**2. M. hirsuta** Cav.

Flowers mostly in axillary clusters; corolla only slightly exceeding the calyx, usually pink.

Plants woody; bracts brown, chafflike, scarcely exceeding the flowers. **3. M. nodiflora** Swartz.

Plants herbaceous; bracts green, linear.

Stems viscid-pubescent; bracts longer than the flowers; flower clusters sessile-------------------------------**4. M. melissaefolia** Benth.

Stems glabrous or nearly so; bracts not exceeding the flowers; flower clusters stalked ---------------------**5. M. manducata** Wright.

The Melochias have mostly stellate pubescence and ovate to oblong, dentate leaves. The flowers are small but sometimes rather showy, the fruit a 5-celled capsule.

M. lupulina is a common herb or small shrub. *M. hirsuta* is common on the Pacific slope, usually in wet soil. It is known locally as "hierba del soldado"; in Costa Rica as "raíz de toro;" in Porto Rico as "bretónica." *M. nodiflora*, a slender shrub of 1 to 2 meters, is frequent on the Pacific slope. *M. melissaefolia* is frequent, especially in marshes, and *M. manducata* has been collected in a swamp near the Tecumen River.

90. DILLENIACEAE. Dillenia Family

Filaments not dilated at apex; flowers about 20 cm. broad; fruit about 10 cm. in diameter; cultivated tree--------------------------------**1. DILLENIA.**

Filaments dilated at apex; flowers and fruit small, usually 1 cm. broad or less; native species.

Sepals dissimilar, the 2 inner erect and inclosing the fruit. Plants scandent; flowers yellow, mostly in terminal panicles---------------**2. DAVILLA.**

Sepals all alike, spreading or ascending, not inclosing the fruit.

Flowers chiefly in terminal panicles; carpels 1 to 5, distinct, glabrous. Woody vines; flowers white----------------------**3. TETRACERA.**

Flowers axillary or lateral, in panicles or umbels; carpels 1, or 2 and united.

Carpel 1; plants usually scandent-----------------**4. DOLIOCARPUS.**

Carpels 2; plants erect. Flowers white--------------**5. CURATELLA.**

The genus *Saurauia* is represented in the mountains of Panama. The plants of the family are trees or shrubs with alternate, simple, entire or toothed, usually very rough leaves, without stipules. The flowers have 3 to 5 sepals, distinct or nearly so, 5 or fewer petals, and numerous free stamens.

1. DILLENIA L.

Dillenia indica L., native of tropical Asia, planted for ornament in Balboa, is a handsome medium-sized tree with long, obovate-oblong, coarsely toothed leaves. The large, pure white flowers, with bright yellow stamens, are extremely showy. The hard green fruit, consisting in large part of the enlarged fleshy sepals, is as sour as rhubarb. In India the fruit is eaten.

2. DAVILLA Vand.

Larger sepals hirtellous; leaves pubescent beneath, reticulate-veined. **1. D. kunthii** St. Hil.

Larger sepals glabrous; leaves glabrate, not reticulate-veined. **2. D. rugosa** Poir

No other species are known from Central America. The plants are woody vines, with nearly entire, oblong to rounded-obovate, thick, rough leaves, and small but showy, bright yellow flowers, whose petals fall quickly.

D. kunthii, common about the zone, is called "chumico" and "chumiquillo." In Tabasco it is known as "bejuco de tachicón"; in Guatemala as "bejuco chaparrón"; in Colombia as "bejuco tomé." The tough flexible stems are sometimes employed for tying the framework of huts.

D. rugosa is frequent on the Atlantic slope. The seeds are reported to have violent emetic-cathartic properties. In Nicaragua it is called "hoja chigüe"; in Cuba, "bejuco castaño."

3. TETRACERA L.

Fruit of a single carpel. Sepals glabrous within.
1. **T. sessiliflora** Triana & Planch.
Fruit of 2 to 5 carpels.
  Sepals sericeous within; leaves stellate-pubescent beneath..2. **T. volubilis** L.
  Sepals glabrous; leaves glabrate......................3. **T. oblongata** DC.

No other species are known from Central America. The plants are woody vines with oblong or obovate, rough, usually toothed leaves.

T. sessiliflora is frequent on the Atlantic slope. In Mexico it is called "bejuco de agua." The stems have large ducts full of sap. From a section of the stem there may be procured a large amount of clear water which is sometimes drunk by travelers in the dry season, when surface water is not obtainable.

T. volubilis, common here, is called "chumico," and the name "pasmo de sol" is reported. In Nicaragua the vine is called "hoja chigüe"; in Costa Rica "raspa" and "raspa-guacales"; in Colombia "bejuco chaparro" and "bejuco tomé"; in Cuba "bejuco guará" and "bejuco carey." *T. oblongata* is occasional on both slopes.

4. DOLIOCARPUS Roland

Pedicels shorter than the flowers.
  Leaves entire..........................1. **D. olivaceus** Sprague & Williams.
  Leaves sinuate-serrate.....................2. **D. brevipedicellatus** Garcke.
Pedicels much longer than the flowers.
  Flowers in lateral clustered racemes..............3. **D. multiflorus** Standl.
  Flowers in lateral clusters, the pedicels simple.
    Ovary glabrous; leaves not punctate.......4. **D. dentatus** (Aubl.) Standl.
    Ovary pubescent; leaves punctate beneath.............5. **D. major** Gmel.

No other species are known from Central America. The plants are large woody vines with thick, usually smooth, oblong to obovate leaves.

D. olivaceus has been collected near the Tapia River and *D. brevipedicellatus* near Fort San Lorenzo. *D. multiflorus* is endemic and known only from the Atlantic slope. *D. dentatus* occurs on the Pacific slope and *D. major* (*D. punctatus* Standl.) grows on the Atlantic watershed.

5. CURATELLA L. SANDPAPER-TREE

Curatella americana L., the only North American species, frequent on brushy slopes and in savannas, is a shrub or small tree, rarely 8 meters high, usually with crooked trunk and branches. The large leaves are oval or elliptic, thick, sinuate, very rough, and nearly sessile. The black seeds are surrounded by an aril. The brown or reddish brown, rather hard and heavy, coarse wood is used for fence posts, fuel, charcoal, and sometimes for cabinetwork. The leaves contain silica, and are much used in Central America as a substitute for sandpaper. The bark is sometimes utilized for tanning. In Panama the tree is called "chumico" and "chumico de palo," and the name "curatela" was reported by Seemann. In Costa Rica it is called "hoja chigüe" and "raspa-guacal"; in Guatemala and Honduras "chaparro"; in Salvador "lengua de vaca" and "malcajaco"; in Mexico "raspa-viejo," "tlachicón," and "hoja man"; in Cuba "vaca-buey" and "careicillo"; in Venezuela "curata."

91. OCHNACEAE. Ochna Family

Petals bright yellow; shrubs; stamens 10; fruit drupaceous......1. **OURATEA.**
Petals pink, purple, or white; herbs; fertile stamens 5; fruit capsular.
2. **SAUVAGESIA.**

The genus *Cespedesia* is represented in Panama. The plants of the family are glabrous, with simple leaves and entire or pectinate stipules. The flowers have 5 sepals and 5 petals and a 3 to 6-celled ovary.

1. OURATEA Aubl.

Nerves of the leaves impressed.................1. **O. nitida** (Swartz) Engler.
Nerves not impressed....................2. **O. wrightii** (Van Tiegh.) Riley.

The Ourateas are shrubs or small trees with oblong to elliptic, thick, shining, serrate, short-petioled leaves and showy flowers in terminal panicles. The juicy black fruit is borne upon a fleshy red disk.

O. nitida grows on Ancón Hill, and *O. wrightii* is common in forests. *O. isthmica* Riley, described from this region, is scarcely distinguishable from *O. wrightii.*

2. SAUVAGESIA L.

Lobes of the stipules threadlike, bearing small glands at about the middle.
1. **S. pulchella** Planch.
Lobes of the stipules without glands.
  Sepals 2 mm. long; plants about 10 cm. high............2. **S. tenella** Lam.
  Sepals 5 mm. long; plants usually about 30 cm. high.........3. **S. erecta** L.

The Sauvagesias are small slender herbs with crenate-serrate leaves, their stipules dissected into threadlike lobes. The small and inconspicuous flowers are mostly solitary in the leaf axils on long pedicels.

S. pulchella grows in grassland or bogs near the Pacific, and *S. tenella* on the savannas. *S. erecta* is occasional in wet soil.

92. MARCGRAVIACEAE. Marcgravia Family

The genus *Marcgravia* is represented in Panama.

1. SOUROUBEA Aubl.

Spur of the bract elongate, 2-cleft at base..............1. **S. guianensis** Aubl.
Spur caplike.....................2. **S. pilophora** (Triana & Planch.) Wittm.

The plants are epiphytic shrubs, usually pendent from trees or sometimes scandent, the leaves fleshy, alternate, entire, short-petioled, oblong to obovate. The racemose flowers, subtended by spurred bracts and by sepal-like bracts, have 5 sepals and 5 connate petals which are quickly deciduous. The fruit is globose and fleshy.

S. guianensis has been collected several times on the Atlantic slope, and *S. pilophora* has been found at Alhajuela.

93. THEACEAE. Tea Family

Stamens numerous, the anthers basifixed; leaves petiolate; fruit globose-ovoid, smooth; flowers pedicellate........................**1. TERNSTROEMIA.**

Stamens 5, the anthers versatile; leaves sessile; fruit obovoid, 10-sulcate; flowers sessile...**2. PELLICIERA.**

The Theaceae have alternate, entire, more or less fleshy leaves, without stipules. The axillary flowers have 5 sepals, 5 distinct or slightly united petals, and 5 or many stamens. The fruit is indehiscent.

1. TERNSTROEMIA Mutis

Ternstroemia seemannii Triana & Planch., collected several times in the region, is a glabrous shrub or small tree with oblanceolate acute leaves and long-pediceled whitish flowers. Seemann gives the vernacular name as "manglillo." The name *Taonabo* is sometimes used for the genus.

2. PELLICIERA Planch. & Triana

The only species, *P. rhizophorae* Planch. & Triana, is a small tree growing in mangrove swamps, and suggesting the mangrove in general appearance. The leaves are oblong-lanceolate, acute, with unequal sides, the flowers white or pink, 5 cm. long, and subtended by 2 long stipule-like bractlets. The hard fruit is 6 to 7 cm. long. The local name is "palo de sal."

94. HYPERICACEAE. St.-Johnswort Family

1. VISMIA Vand.

Leaves shallowly cordate at base, brown-tomentose beneath.
1. V. latifolia Choisy.

Leaves truncate to obtuse at base.
  Calyx 5 to 6 mm. long; tomentum of leaves fine, thin, and closely appressed; sepals spreading in fruit.
    Leaves ovate-oblong or oblong-lanceolate, mostly 2 to 5 cm. wide, glabrate beneath....................................**2. V. viridiflora** Duchass.
    Leaves mostly elliptic-ovate and 5 to 7 cm. wide, with a pale or brownish tomentum..........................**3. V. guianensis** (Aubl.) Pers.
  Calyx 7 to 10 mm. long; tomentum rather coarse and not appressed; sepals erect in fruit.
    Mature sepals 7 mm. long; tomentum of leaves whitish, at least in age.
4. V. dealbata H. B. K.
    Mature sepals 9 to 10 mm. long; tomentum of leaves ferruginous.
5. V. ferruginea H. B. K.

The Vismias are shrubs or small trees with opposite entire leaves, mostly ovate and tomentose beneath, without stipules. The yellowish or whitish flowers, arranged in terminal cymes, have 5 sepals and 5 petals which are usually villous above. The numerous stamens are arranged in 5 fascicles. The fruit is a many-seeded berry. The differences between the species are poorly marked, and it is doubtful whether as many as 5 species occur about the zone.

V. latifolia, frequent on the Atlantic slope, is a tree about 6 meters high. *V. viridiflora* is endemic in Panama, and a common shrub in forests. *V. guianensis*, occasional on the Atlantic slope, is called "sangrillo." *V. dealbata* is frequent, and the name "pinta-mozo" is reported for it. *V. ferruginea*, also common, is known as "sangre de perro," a name given in allusion to the fact that the sap turns red upon exposure to the air. It is called also "pinta-mozo," and in Guatemala it is known as "achiotillo" and "camparaguey."

95. CLUSIACEAE. Clusia Family

Fruit dehiscent at maturity.
  Cells of the ovary 2 to many-ovuled.
    Flowers solitary or panicled .... 1. **CLUSIA.**
    Flowers racemose .... 10. **MARILA.**
  Cells of the ovary 1-ovuled.
    Outer 2 sepals subvalvate, inclosing the bud .... 2. **TOVOMITA.**
    Outer sepals not valvate.
      Sepals 5 .... 3. **CHRYSOCHLAMYS.**
      Sepals 4, decussate .... 4. **TOVOMITOPSIS.**
Fruit indehiscent.
  Leaves with very numerous fine lateral nerves, the nerves mostly less than 1 mm. apart and not or scarcely connected by transverse nerves. 5. **CALOPHYLLUM.**
  Leaves with few lateral nerves, or the nerves sometimes numerous but connected by transverse nerves.
    Leaves broadly rounded at apex .... 6. **MAMMEA.**
    Leaves acute or acuminate.
      Fruit tuberculate .... 7. **RHEEDIA.**
      Fruit smooth.
        Style elongate; native tree .... 8. **SYMPHONIA.**
        Style obsolete; cultivated tree .... 9. **GARCINIA.**

The Clusiaceae are shrubs or trees with entire, opposite, usually coriaceous leaves, without stipules, the sap resinous and commonly yellow. The flowers are mostly unisexual, often large and showy, with 2 to 6 or more sepals and as many petals, and numerous stamens. The ovary is 2 to several-celled.

1. CLUSIA L. COPEY

Fruit 2.5 cm. or less in diameter; leaves usually twice as long as wide, thin; inflorescence several-flowered .... 1. **C. minor** L.
Fruit 5 to 8 cm. in diameter; leaves nearly as wide as long, very thick; flowers solitary or 2 together .... 2. **C. rosea** L.

Other species occur in Panama. The Clusias are glabrous trees, often epiphytic on other trees. The leaves are many-nerved, the flowers usually pink and handsome, with thick fleshy petals. The capsule is leathery, splitting when ripe, the segments radiating and reflexed, exposing the numerous arillate seeds.

C. minor, a tree of 5 to 8 meters occasional in the region, is called "copey." The elastic gum obtained from the trunk is used here for bandaging hernia in children, and for various other purposes. *C. rosea* also is occasional. The petals are 3 to 4 cm. long, the fruit nearly white. This species also is known as "copey." Its wood is hard, heavy, compact, strong, and reddish brown. It is reported by Oviedo that in early days the Spaniards used the thick heavy leaves as a substitute for writing paper and that they also made playing cards from them when pasteboard cards could not be procured.

2. TOVOMITA Aubl.

The only North American species is *T. stylosa* Hemsl., a glabrous shrub or small tree, growing in the forests of the Atlantic slope. It has elliptic leaves 7 to 15 cm. long.

3. CHRYSOCHLAMYS Poepp. & Endl.

Chrysochlamys membranacea Planch. & Triana is reported from Lion Hill by Hemsley. It is a glabrous tree with oblong-acuminate leaves 20 cm. long and 6 cm. wide.

4. TOVOMITOPSIS Planch. & Triana

Tovomitopsis nicaraguensis (Oerst.) Planch. & Triana is a shrub or tree of 3 to 6 meters, found in wet forests of the Atlantic slope. It has large, oblong to elliptic, acuminate leaves and small whitish flowers.

5. CALOPHYLLUM L.

Leaves acute or acuminate.............................1. **C. kunstleri** King.
Leaves rounded at apex.
  Leaves oval, twice as long as broad or shorter; cultivated tree.
2. **C. inophyllum** L.
  Leaves narrowly oblong, about 4 times as long as broad; native tree.
3. **C. longifolium** Willd.

At least one other native species is known from Panama. The plants are glabrous trees with remarkably handsome, shining leaves, the flowers borne in axillary or terminal racemes or panicles. The ovary is 1-celled.

C. kunstleri, native of the Malay Peninsula, is planted in Ancón. *C. inophllum*, of the East Indies, also is planted in Ancón and Balboa. *C. longifolium*, growing in forests about the zone, is a large tree with leaves 30 cm. long or more, known here as "maría." According to Oviedo's statements, the name maría, applied to various plants of this and some other families, is of Carib origin, and has no connection with the common Spanish personal name María.

6. MAMMEA L. MAMEY

The only species is *M. americana* L., the well-known mamey or mammee-apple, native of the West Indies, and planted, usually rather sparingly, in Central America. It is a handsome tree, sometimes 20 meters high, with a dense crown of thick glossy oval leaves 10 to 16 cm. long. The fragrant white flowers are axillary and solitary or clustered. The fruit is subglobose, 8 to 20 cm. long, brownish, with firm, yellow or reddish flesh, which when cut exudes a white sap. The flesh is of most agreeable flavor, somewhat suggesting a clingstone peach. The fruit is eaten raw or cooked.

The red or reddish brown, hard and heavy, strong and durable wood is used in some regions for posts, piling, and general construction. In most parts of Central America the tree is called "mamey," but about the zone it is called "mamey de Cartagena," to distinguish it from the sapote, which is known as "mamey de tierra." In Mexico the mamey is called "zapote mamey," "zapote de niño," and "zapote de Santo Domingo."

7. RHEEDIA L.

Rheedia madruno (H. B. K.) Planch. & Triana (pl. 53), frequent in the forests of the Atlantic slope, is a tree of 10 to 12 meters with oblong to elliptic, acuminate leaves. The flowers are lateral or axillary. The local names are "madroño," "machari," and "fruta de mono." The yellow sap is used for treating ulcers and other sores.

Several other species of *Rheedia* are known from Panama.

8. SYMPHONIA L. f.

Symphonia globulifera L. f. occurs in the Atlantic forests, and is a large tree with small oblong-lanceolate leaves. The fruit is said to be edible. The rather hard and heavy, greenish brown, coarse wood is employed to some extent for construction purposes. The bark is rich in resin which is used by the Indians for caulking boats and for torches. In Panama the tree is called "cerillo," in Guatemala "barillo."

9. GARCINIA L.

Garcinia tinctoria (DC.) W. F. Wight, a tree planted about Balboa and Ancón, and occasionally elsewhere, is a native of the East Indies. The oblong leaves are 12 to 35 cm. long, and the yellow fruit as large as a small apple.

G. mangostana L., the mangosteen, native of the Malayan region and one of the most celebrated of tropical fruits, has been planted at Frijoles.

10. MARILA Swartz

Marila macrophylla Benth. was collected at Chagres by Fendler. It is a tree with oblong acuminate glabrous leaves, and elongate racemes of small flowers.

96. BIXACEAE. Anatto Family

1. BIXA L. ANATTO

The family consists of a single genus and species, *B. orellana* L. (pl. 54). The specific name was given in honor of Francisco Orellana, discoverer of the Amazon. The plant is a shrub or small tree, 2 to 9 meters high, widely distributed in tropical America, and common in this region, both wild and planted. It has long-stalked, alternate, entire, broadly ovate leaves, minutely scaly beneath, and terminal panicles of white or pink flowers, with 5 petals 1.5 to 2.5 cm. long. The fruit is a globose or ovoid capsule 2 to 4 cm. long, usually covered with spinelike bristles but sometimes unarmed. Within are numerous round seeds surrounded by orange-red pulp.

From the pulp is obtained an orange dye, the anatto of commerce, which is generally used in Central America for coloring rice and other articles of food. It is exported, chiefly from South America, to Europe and the United States, where it is employed extensively for coloring butter and cheese as well as oils and varnish. By the Indians it has been used since immemorial times for painting the body, partly for adornment and partly for relief from gnats, mosquitoes, and other insects.

The wood is pinkish yellow, porous, and soft. The bark contains a tough fiber from which twine is sometimes made. A gum similar to gum arabic is obtained from the branches. The pulp is employed in domestic medicine as a remedy for cutaneous diseases, and is applied to burns to prevent the formation of scars.

In Panama the shrub is called "achote." This and the form "achiote" are the names used most commonly in Central America, the name being of Aztec origin.

97. COCHLOSPERMACEAE. Poroporo Family

1. COCHLOSPERMUM Kunth. POROPORO

The only North American species is *C. vitifolium* (Willd.) Spreng. (*Maximilianea vitifolia* Krug & Urb.), widely distributed in tropical America and common about the zone, especially on brushy hillsides. It is a deciduous tree of 5 to 12 meters, but sometimes blooms when less than 2 meters high. The long-stalked leaves are alternate, cordate at base, deeply 5-lobed, the lobes serrate and nearly glabrous. The handsome, bright yellow flowers, suggesting roses, are 10 cm. broad, arranged in terminal clusters, and have 5 sepals, 5 petals, and numerous stamens. The fruit is a 5-valved obovoid capsule 7 to 8 cm. long, finely pubescent, and containing numerous kidney-shaped seeds covered with long white cotton.

The wood is soft and spongy. The bark contains a tough fiber. The cotton is suitable for stuffing pillows. In Panama the tree is well known as "poroporo." In Salvador, Guatemala, and Mexico it is called "tecomasuche" or "tecomasúchil"; in Colombia and Venezuela "carnestolendas" (probably because it flowers during Lent); in Mexico "cocito," "rosa amarilla," "apompo," "pochote," "cojón de toro," and "palo amarillo"; in Nicaragua "bombón" and "catamericuche"; in Cuba "botija."

98. VIOLACEAE. Violet Family

Lower petal spurred; scandent shrubs. Leaves alternate..1. **CORYNOSTYLIS.**
Lower petal not spurred; plants not scandent.
  Corolla somewhat irregular; stamens united; flowers mostly solitary in the leaf axils; leaves alternate..............................2. **HYBANTHUS.**
  Corolla regular; stamens free; flowers in axillary racemes; leaves opposite..3. **RINOREA.**

The genus *Viola* (violet) is represented in the high mountains of Panama. The plants of the family are herbs or shrubs with simple toothed stipulate leaves. The flowers have 5 sepals, 5 petals, and 5 stamens, and the fruit is a 1-celled 3-valved capsule.

1. **CORYNOSTYLIS** Mart. & Zucc.

The genus consists of a single species, *C. arborea* (L.) Blake, occasional in forests on the Atlantic slope. It is a large vine with ovate or elliptic, glabrous leaves and white flowers 3.5 cm. long.

2. **HYBANTHUS** Jacq.

Annual herb; flowers about 5 mm. long......1. **H. riparius** (H. B. K.) Standl.
Shrub; flowers 3 to 4 cm. long............2. **H. anomalus** (H. B. K.) Standl.

Hybanthus riparius is frequent on the Pacific slope, an inconspicuous small herb with white or lavender flowers. In Salvador it is called "hierba del rosario." *H. anomalus* is a shrub of 1 to 3 meters, with white flowers, frequent in forests of the Atlantic watershed.

The name *Ionidium* has been applied to this genus.

3. **RINOREA** Aubl.

Leaves puberulent and short-pilose with spreading hairs beneath, especially on the costa................................1. **R. sylvatica** (Seem.) Kuntze.
Leaves with a few straight appressed hairs beneath along the costa.
2. **R. squamata** Blake.

The plants are shrubs or small trees, 2 to 6 meters high, with short-petioled, lanceolate to elliptic-obovate, crenate leaves, the flowers small and inconspicuous. Both species are occasional in forests, and both are endemic. *R. squamata* is known as "molenillo," the slender branches with spreading twigs being used as egg-beaters.

99. FLACOURTIACEAE. Flacourtia Family

- Stipules large and leaflike. Flowers terminal, clustered or in short racemes; fruit baccate, 3 to 5-celled.................................**1. PROCKIA.**
- Stipules small and inconspicuous.
  - Fruit covered with long spinelike bristles. Leaves entire; flowers with petals, racemose-paniculate....................................**2. ONCOBA.**
  - Fruit unarmed.
    - Leaves 3-nerved. Flowers in large terminal panicles; petals present. **3. HASSELTIA.**
    - Leaves pinnate-nerved.
      - Flowers in terminal panicles; pubescence of lower surface of leaves dense, of grayish appressed hairs. Petals present........**4. BANARA.**
      - Flowers in lateral or axillary clusters, corymbs, spikes, or racemes.
        - Flowers in very dense spikes, the spikes paniculate. **5. TETRATHYLACIUM.**
        - Flowers not spicate.
          - Petals present; flowers in racemes................**6. HOMALIUM.**
          - Petals none; flowers not in racemes.
            - Disk of the flower without staminodia-like apendages.
              - Anthers linear; flowers perfect; plants unarmed..**7. PATRISIA.**
              - Anthers short; flowers usually dioecious; plants usually armed with spines.............................**8. XYLOSMA.**
            - Disk with staminodia-like appendages. Plants unarmed.
              - Style none; stamens 30 or more.............**9. ZUELANIA.**
              - Style evident; stamens 6 to 22..............**10. CASEARIA.**

The plants are shrubs or trees with alternate, entire or toothed, petioled, often pellucid-punctate leaves. The flowers are mostly small and inconspicuous, with free or united sepals and free petals, or the petals absent. The stamens are usually numerous, either distinct or united. The fruit is baccate or capsular.

1. PROCKIA L.

The only North American species, *P. crucis* L., common here, especially on the Pacific slope, is usually a shrub of 2 to 3 meters, but sometimes a tree. The thin leaves are broadly ovate, serrate, and pubescent or glabrate. The petals are commonly abortive or absent. In Colombia the shrub is called "huesito"; in Cuba "guacimilla."

2. ONCOBA Forsk.

The only Central American species, *O. laurina* (Presl) Warb., frequent about the zone, is a shrub or tree of 3 to 15 meters, with glabrous oblong-ovate leaves 12 to 30 cm. long, and small white flowers. The globose fruit is 1 cm. or more in diameter, containing 1 to 4 seeds and red pulp. It is said to be known as "guavo cimarrón" and "carbonero." The wood is yellow, hard, and heavy, and takes a fine finish. An African species of *Oncoba* furnishes an oil whose properties are said to be similar to those of chaulmoogra oil, which has been employed in recent years for the treatment of leprosy.

3. HASSELTIA H. B. K.

Hasseltia floribunda H. B. K. is common here, a large shrub or a small tree as much as 8 meters high. The leaves are oblong to elliptic, glabrate, and coarsely serrate. The small white flowers are not conspicuous. In Darién the tree is called "raspalengua."

4. BANARA Aubl.

Banara guianensis Aubl. is frequent in forests. It is a shrub or small tree, sometimes 8 meters high, with short-petioled, oblong to ovate, acuminate, serrate leaves and small white flowers.

5. TETRATHYLACIUM Poepp. & Endl.

Tetrathylacium johanseni Standl., frequent on the Atlantic slope, is a small tree with short-petioled, oblong, cuspidate-acuminate, nearly entire, glabrous leaves. The small flowers are sessile in the axes of bracts and form dense catkinlike spikes. The 4 petals are united into a compressed or angled tube; the sepals are minute or obsolete. The fruit is a subglobose coriaceous berry, containing numerous seeds.

One other species is known from Panama.

6. HOMALIUM Jacq.

Homalium stenosepalum Blake, endemic in the forests of the region, is a tree of 25 to 30 meters with elliptic, crenate, nearly glabrous leaves and small white flowers.

7. PATRISIA L. Rich.

The only North American species, *P. pyrifera* L. Rich., has been collected in forests of the Atlantic slope. It is a small tree with sparse stellate pubescence, the large leaves oblong, entire, and caudate-acuminate. The solitary short-stalked axillary flowers are 3 cm. long.

8. XYLOSMA Forst.

Leaves acuminate..............1. **X. intermedia** (Triana & Planch.) Griseb.
Leaves obtuse or rounded at apex.
  Young branches mostly armed with long stout spines; leaves mostly obovate, usually obtuse..............2. **X. hemsleyana** Standl.
  Young branches mostly unarmed; leaves oval to suborbicular, broadly rounded at apex..............3. **X. panamensis** Turcz.

The *Xylosmas* are shrubs or small trees, the trunk usually armed with large branched spines, the leaves short-petioled and crenate. The flowers are very small, whitish, and commonly clustered in the leaf axils. The fruit is a 2 to 8-seeded berry.

X. intermedia (*Myroxylon intermedium* Kuntze) has been collected near Catival. It is known in Salvador as "aguja de árrea." *X. hemsleyana* (*X. elliptica* Clos; *Myroxylon ellipticum* Kuntze) is common on the Pacific slope. In Chiriquí it is called "roseto"; in Salvador "aguja de árrea." *X. panamensis*, endemic in Panama, grows on the Atlantic slope, often in thickets along the beach. At Viento Frío it is called "jobo de lagarto."

9. ZUELANIA A. Rich.

The only Central American species, *Z. roussoviae* Pittier (pl. 55), which is occasional on the Atlantic watershed, is a tree of 10 to 25 meters with deciduous, oblong to oval leaves, densely pubescent beneath. The whitish flowers are in dense lateral clusters. The fruit is a fleshy capsule 3.5 cm. in diameter. In Darién the tree is called "caraño" and the gum it produces is employed as a vomitive. In Mexico the tree is known as "volantín."

10. CASEARIA Jacq.

Flowers in axillary peduncled corymbs. Leaves crenate, pellucid-punctate.
1. C. nitida (L.) Jacq.
Flowers clustered in the leaf axils.
  Leaves entire or practically so..........................**2. C. sylvestris** Swartz.
  Leaves serrate or crenate.
    Leaves closely and regularly serrate..................**3. C. arguta** H. B. K.
    Leaves remotely crenate.
      Leaves oblong-lanceolate, thick, opaque......**4. C. javitensis** H. B. K.
      Leaves elliptic or obovate, thin, pellucid-punctate.
5. C. guianensis (Aubl.) Urban.

Other species occur in Panama. The Casearias are shrubs or small trees, usually with pellucid-punctate leaves, and with small white inconspicuous flowers. The fruit is a 3 or 4-valved capsule, usually red at maturity, the seeds covered by a fleshy aril.

C. nitida is a common shrub in thickets of the Pacific slope. It is called here "raspa-lengua"; in Costa Rica "cerito" or "cerillo"; in Salvador "canjuro," "canjurillo," and "palanco"; in Guatemala "vara blanca"; in Nicaragua "comida de culebra." *C. sylvestris* is a common shrub or tree, 3 to 6 meters high. In Oaxaca it is called "guayabillo"; in Porto Rico "cafecillo cimarrón." *C. arguta* is a frequent shrub, known here as "raspalengua," in Costa Rica as "palo María," and in Guatemala as "guayabillo." *C. javitensis* grows in forests of the Atlantic watershed. In Chiriquí it is called "maúro." *C. guianensis* is an occasional shrub, known in Darién as "palo de la cruz."

100. TURNERACEAE. Turnera Family

Receptacle of the flower with a corona; annual herb; leaves stellate-pubescent beneath..**1. PIRIQUETA.**
Receptacle without a corona; shrub; leaves nearly glabrous, the pubescence of simple hairs..**2. TURNERA.**

The genus *Erblichia* is represented in Panama. The plants of the family have alternate, usually serrate leaves with stipules. The flowers are chiefly axillary, regular and perfect, with 5 sepals or calyx lobes, 5 yellow (in ours) fugacious petals, and 5 distinct stamens. The fruit is a 3-valved many-seeded 1-celled capsule.

1. PIRIQUETA Aubl.

Piriqueta cistoides (L.) Meyer has been found in grassland on the Pacific slope. It is a low erect herb with linear-oblong leaves and small flowers.

2. TURNERA. L.

Turnera panamensis Urban, endemic in Panama, is occasional in forests. It is a slender shrub of 1 to 4 meters with lance-oblong leaves and showy flowers about 2.5 cm. long.

101. PASSIFLORACEAE. Passionflower Family

(Contributed by Ellsworth P. Killip)

1. PASSIFLORA L. Passionflower

Bracts setaceous, usually soon deciduous, scattered along the peduncle, not forming an involucre; flowers less than 4 cm. wide, white or greenish white.
  Petioles glandular.
    Leaves transversely oblong, peltate..................**1. P. coriacea** Juss.
    Leaves ovate to oblong, entire to 3-lobed, not peltate.
      Petals none; petiolar glands orbicular, less than 1 mm. wide, borne above the middle of the petiole; leaves polymorphic, entire to 3-lobed in individual plants..............................**2. P. suberosa** L.
      Petals present; petiolar glands auricular, more than 1 mm. wide, borne near base of petiole; leaves ovate-lanceolate, angulately 3-lobed or subentire.............................**3. P. auriculata** H.B.K.
  Petioles glandless.
    Peduncles solitary, 3 cm. long or more, slender; leaves membranous.
      Outer corona filaments filiform, the inner capitate..**4. P. misera** H. B. K.
      Outer corona filaments liguliform, the inner subulate.
        5. P. punctata H. B. K.
    Peduncles usually in pairs, less than 3 cm. long, stout; leaves coriaceous or subcoriaceous..................................**6. P. biflora** Lam.
Bracts linear-oblong to orbicular, persistent, forming an involucre at base of flower; flowers usually more than 4 cm. wide, showy, often highly colored.
  Bracts bipinnatisect, the ultimate segments gland-tipped...**7. P. hispida** DC.
  Bracts entire to serrulate.
    Leaves lunately bilobed, conspicuously reticulate-veined; petioles glandless.......................................**8. P. pulchella** H. B. K.
    Leaves entire or 3-lobed, very faintly reticulate-veined; petioles with 1 or more glands.
      Stem sharply 4-angled; petioles 6-glandular; fruit more than 15 cm. long.................................**9. P. quadrangularis** L.
      Stem terete; petioles 1 to 4-glandular; fruit much less than 15 cm. long.
        Flowers red or scarlet; plants densely rufo-tomentellous.
          10. P. vitifolia H. B. K.
        Flowers blue, purple, or white; plants glabrous, pilosulous, or hispid-hirsute.
          Bracts lanceolate, attenuate-acuminate; plants hispid-hirsute.
            11. P. menispermifolia H. B. K.
          Bracts ovate to orbicular, obtuse or acute; plants glabrous or pilosulous.
            Petiolar glands subulate; bracts free to base; flowers white.
              12. P. subpeltata Ortega.
            Petiolar glands disk-shaped, sessile; bracts united nearly to middle; flowers blue, purple, or violet.
              Glands borne at apex of petiole; leaves entire, rarely 3-lobed, glaucous beneath, the basal lobes overlapping.
                13. P. seemanni Griseb.
              Glands borne below middle of petiole; leaves entire or 3-lobed, green beneath, the basal lobes, if present, not overlapping.
                Leaves entire, rounded or truncate at base; ovary subglobose, glabrous.....................**14. P. maliformis** L.
                Leaves 3-lobed, deeply cordate at base; ovary ovoid, white-tomentose..................**15. P. williamsii** Killip.

Several other species occur in the mountains of Panama and in the Darién region. All of the plants from the vicinity of the Canal Zone are slender or coarse vines with well-developed tendrils. The leaves of *P. suberosa*, *P. biflora* (*P. lunata* Willd.), and *P. seemanni* are extremely variable, even in the case of individual plants. *P. cuneata*, a South American species, was erroneously recorded by Hemsley from Lion Hill, the specimen proving to be *P. punctata*.

The large flowers of *P. seemanni*, variegated with blue and white, and the showy scarlet ones of *P. vitifolia* are frequently seen in the dense forests and clearings about the Canal Zone. Both are known as "guate-guate," a name also given to *P. biflora*. In parts of Central America the names "calzoncillo," "murciélago," "ala de murciélago," and "camacarlata" are applied to *P. coriacea*, *P. biflora*, and *P. pulchella*.

P. subpeltata (*P. alba* Link & Otto), ranging from Mexico to northern South America, is rare in Panama.

The cultivation of passionflowers for their fruit is not so extensive in Panama as in many parts of tropical America. The large fruits of *P. quadrangularis*, often as much as 25 cm. long, are occasionally found in Panama markets where they are known as "granadillas." *P. maliformis*, the West Indian sweet-calabash, a species with much smaller, very hard-shelled, spherical fruits, has also been introduced. The fruit of *P. seemanni* is said to be edible.

102. CARICACEAE. Papaya Family

1. CARICA L. Papaya

The common papaya, *C. papaya* L., is planted abundantly about the zone and also grows wild. The papayas of Panama are among the best to be found anywhere, of good flavor, and often of enormous size.

The plant is grown throughout the tropics. It has a usually simple, thick, pale green stem 2 to 8 meters high, suggesting a cabbage stalk, and milky sap. The long-stalked leaves are clustered at the top of the stem, and are 50 cm. broad or larger, glabrous, and much lobed. The flowers are fragrant, pale yellow, the staminate in slender panicles. The staminate and pistillate flowers are borne upon separate plants. The fruit varies greatly in shape, size, and quality, but in general it resembles an elongate cantaloupe, with yellow or greenish skin and sweet juicy flesh of delicate consistency. The fruits of wild plants are small, usually the size of an egg.

The fruit is usually eaten raw, but it is sometimes used in preserves, pies, and sherbets. The fruit and sap contain an enzyme, papain, resembling animal pepsin in its digestive action, and this product has become an article of commerce, being employed in the treatment of dyspepsia and allied affections. Tough meat wrapped in the leaves is said to become tender, and the leaves are sometimes boiled with meat. The name "papaya" is applied to the fruit almost everywhere in Latin America; the plant is "papayo." In Cuba the papaya is called "fruta bomba."

103. LOASACEAE. Loasa Family

The genera *Loasa* and *Gronovia* are represented in Panama.

1. MENTZELIA L.

Mentzelia aspera L., rather frequent in dry thickets, is a branched herb with brittle stems and very rough pubescence. Some of the hairs have short barblike recurved projections at the apex. The leaves are hastate. The pale orange flowers are mostly axillary, with 5 petals about 1 cm. long and numerous stamens; the fruit is a cylindric capsule.

104. BEGONIACEAE. Begonia Family

1. BEGONIA L. Begonia

Plants acaulescent, the flowering stems rising from the rhizomes.
  Leaves peltate..............................1. **B. caudilimba** C. DC.
  Leaves not peltate.
    Largest wing of the capsule broader than high, obtuse; leaves finely repand-dentate..............................2. **B. villipetiola** C. DC.
    Largest wing of the capsule longer than broad, acute; leaves with coarse teeth, some of them large and lobelike........3. **B. fimbriata** Liebm.
Plants with leafy stems.
  Plants annual.
    Wings of the fruit subequal, 2 to 3 mm. wide.......4. **B. flexuosa** C. DC.
    Wings very unequal, the largest about 1 cm. wide....5. **B. filipes** Benth.
  Plants perennial.
    Leaves deeply cordate at base, villous beneath..6. **B. cilibracteola** C. DC.
    Leaves not cordate at base, glabrous beneath.
      Stems erect; leaves very oblique at base....7. **B. serratifolia** C. DC.
      Stems scandent; leaves equally rounded at base....8. **B. glabra** Aubl.

Other species occur wild in Panama. No attempt has been made to list here the garden begonias of the region, of which a good many kinds are in cultivation. Most of the greenhouse begonias are of South American origin.

The plants are herbs, usually succulent, with alternate stipulate leaves. The showy flowers are unisexual, in cymes, commonly white or pink, the staminate flowers having 2 opposite sepals and numerous stamens. The fruit is a winged capsule.

B. caudilimba is known from a single specimen, collected along the Río Indio de Gatún. *B. villipetiola,* endemic in Panama, has been found near Gatún. *B. fimbriata* is common in forests, chiefly on the Pacific watershed. The local names are "ala de ángel" and "guaco." *P. flexuosa* grows on the Atlantic slope. *B. filipes* (*B. mameiana* C. DC. is a synonym), frequent in moist forest, is an unattractive plant with red stems and small, greenish white flowers. The local names are "ala de ángel" and "hierba de agua." The type specimen of *B. cilibracteola* was collected between Ahorca Lagarto and Culebra. *B. serratifolia* has been collected between Gorgona and Gatún, and *B. glabra,* a large vine with white flowers, grows in deep wet forest near the Atlantic coast.

105. CACTACEAE. Cactus Family

Leaves large, flat, elliptic or obovate. Large shrubs or small trees, armed with numerous long spines; flowers rose-colored; fruit yellow, broadly truncate at apex..............................1. **PERESKIA.**
Leaves terete or subterete, very small and caducous, or often wanting.
  Areoles at which the spines are inserted bearing numerous small sharp bristle-like glochids; flowers without a definite tube. Large terrestrial plants with broad, disklike, often very spiny joints.
    Stamens longer than the petals; petals erect, red........2. **NOPALEA.**
    Stamens shorter than the petals; petals spreading, yellow..3. **OPUNTIA.**
  Areoles without glochids; flowers (except in *Rhipsalis*) with a definite tube.
    Perianth without a tube, minute (about 2 mm. long); stems terete, unarmed.
4. **RHIPSALIS.**

Perianth with a definite tube, large; stems compressed or angled.
  Plants unarmed; stems strongly compressed. Epiphytic plants.
    Perianth segments spreading; flowers large, 25 to 30 cm. long. **5. EPIPHYLLUM.**
    Perianth segments erect; flowers small, about 2.5 cm. long. **6. WITTIA.**
  Plants usually armed with spines; stems 3 or 5-angled. Plants with large showy white flowers.
    Stems 5-angled, armed with long stout spines..**7. ACANTHOCEREUS.**
    Stems 3-angled, armed with very short spines, or unarmed.
      Scales of the ovary hairy in the axils; flowers 4 to 7 cm. long. **8. WEBEROCEREUS.**
      Scales not hairy in the axils; flowers about 28 cm. long. **9. HYLOCEREUS.**

This large family is represented best in Mexico, and the species are comparatively few in Central America. Other species besides those listed here are in cultivation in Panama.

1. PERESKIA Mill.

Pereskia bleo (H. B. K.) DC. (*P. panamensis* Weber; pl. 56) is planted occasionally in this region, and also occurs wild or escaped in thickets and hedgerows. The species is native in Panama and Colombia. It is a much-branched shrub or tree, sometimes 7 meters high, with a stout trunk which, when young, bears large clusters of spines. The fleshy leaves are elliptic to obovate, petioled, and entire. The large showy flowers have 12 to 15 rose-colored petals 3.5 cm. long. The fruit is curious and very distinctive, in form a broad inverted cone, at maturity smooth and bright yellow.

In general appearance this plant bears little resemblance to our other genera of cactuses. It is known in Panama as "ñajú de espinas" and "ñajú de culebra." Other species of *Pereskia* are frequent along the Pacific slope of Central America, and in some localities are planted extensively for hedges.

2. NOPALEA Salm-Dyck

Plants spineless or rarely with a few short spines on old joints. 1. **N. cochenillifera** (L.) Salm-Dyck.
Plants very spiny..............................2. **N. dejecta** Salm-Dyck.

Both species are occasional here in cultivation, and are sometimes found in thickets to which they have perhaps escaped, although *N. dejecta* may be indigenous in Panama. *N. cochenillifera* is native in Mexico.

The Nopaleas resemble the Opuntias in habit, being tall plants with numerous flat elongate joints or pads, and having usually a definite cylindric trunk. The spines are solitary or clustered, arising from cushionlike clusters of very short and fine, bristle-like glochids. The flowers are small as compared with those of Opuntias, and have short erect red petals. The fruit is a juicy red berry.

N. cochenillifera formerly was much planted in Mexico as a food plant for the cochineal insect, from which a red dye was extracted. Since the perfection of synthetic dyes, the industry has become nearly or quite obsolete.

3. OPUNTIA Mill. PRICKLYPEAR

One species, *O. elatior* Mill., is frequent in the Pacific coastal thickets. It is a very spiny shrub, 2 to 3 meters high, with numerous flat broad joints 15 to 40 cm. long. The stiff spines, in clusters of 2 to 8, are frequently 6 or 7 cm. long. The flowers are about 5 cm. broad, with large spreading yellow petals. The fruit is a large, red, obovoid, very spiny berry with dark red pulp.

Species of *Opuntia* (about 250 are known) are most abundant in Mexico, and only a few grow in Central America. In Mexico they are of great importance as a source of food, but farther south they are little utilized. The usual name for the plant is "nopal"; for the fruit, "tuna."

4. **RHIPSALIS** Gaertn. MISTLETOE CACTUS

R. cassutha Gaertn., a widely distributed species, common here, at least on the Atlantic slope, is an epiphytic plant, forming dense pendent masses sometimes several meters long on the high trees. The much-branched stems are terete, slender (3 to 5 mm. thick), and unarmed. The inconspicuous whitish flowers have a few petals only 2 mm. long. The fruit is a globose translucent white berry 5 mm. in diameter.

5. **EPIPHYLLUM** Haw.

Perianth tube 7 to 9 times as long as the petals___1. **E. phyllanthus** (L.) Haw.
Perianth tube scarcely twice as long as the petals_2. **E. oxypetalum** (DC.) Haw.

The name *Phyllocactus* is often used for the genus. Both species are frequent here in forests, and are widely distributed in tropical America. They are large epiphytic plants with broad flat unarmed stems, crenate or undulate along the margins. *E. phyllanthus* (pl. 57) has white flowers 25 to 30 cm. long, and those of *E. oxypetalum* are of about the same length. The fruit is a large red berry with edible pulp and numerous small black seeds.

6. **WITTIA** Schum.

Wittia panamensis Britt. & Rose (pl. 58) ranges from Panama to Colombia and Venezuela, and was described from specimens collected at Chepo. It is an epiphytic plant with flat fleshy stems 4 to 7 cm. wide, shallowly crenate and unarmed. The flowers are about 2.5 cm. long, with a distinct tube. The fruit is a small berry.

7. **ACANTHOCEREUS** Britt. & Rose

A. pentagonus (L.) Britt. & Rose (*Cereus pentagonus* L.) is frequent in thickets along the beaches, at least on the Pacific slope. The plants are vinelike, usually supported upon shrubs, with thick 5-angled stems bearing numerous clusters of stiff spines. The handsome flowers, open only at night, are funnel-shaped, 14 to 20 cm. long, with numerous green sepals and outer petals and white inner petals. The fruit is a large globose edible red berry. This species is widely distributed in tropical America.

8. **WEBEROCEREUS** Britt. & Rose

W. panamensis Britt. & Rose, an endemic species, is frequent in the forests, and sometimes grows on old walls. It is an epiphytic plant with 3-angled stems 1 to 2 cm. thick, unarmed or with 1 to 3 short weak spines at an areole. The white flowers are 4 to 7 cm. long, and the subglobose, red, irregularly tuberculate fruit is 2 to 3 cm. in diameter.

9. **HYLOCEREUS** Britt. & Rose

H. monacanthus (Lemaire) Britt. & Rose (*Cereus monacanthus* Lemaire), a species known only from Panama and Colombia, is frequent in coastal thickets of the Pacific slope. It is a large vine, the stems 3-angled, the margins of the angles thin, undulate, and bearing very short spines which are solitary or in clusters of 2. The showy flowers, about 28 cm. long, have a short tube and numerous broad white petals. The flowers are open only at night.

106. LYTHRACEAE. Loosestrife Family

Leaves black-dotted on both surfaces. Shrub or small tree; flowers whitish, in small dense axillary cymes.............................1. **ADENARIA.**
Leaves not black-dotted.
  Calyx tubular, often curved, or spurred at base. Herbs or very small shrubs. 2. **CUPHEA.**
  Calyx campanulate or broadly turbinate, not curved or spurred.
    Plants small herbs.
      Capsule septicidally dehiscent; leaves narrowed at base....3. **ROTALA.**
      Capsule bursting irregularly; leaves auricled at base...4. **AMMANNIA.**
    Plants shrubs or trees.
      Flowers 12 to 16-parted; calyx 3 cm. long. Native trees. 5. **LAFOENSIA.**
      Flowers 4 to 7-parted; calyx much less than 3 cm. long; cultivated shrubs or trees.
        Stamens 8; petals about 5 mm. long................6. **LAWSONIA.**
        Stamens numerous; petals usually 2 cm. long or larger. 7. **LAGERSTROEMIA.**

The Lythraceae are herbs, shrubs, or trees, the alternate, opposite, or whorled, entire leaves with minute or no stipules. The flowers are small or large and showy, perfect, with 4 to 16 calyx lobes and petals, the petals inserted in the throat of the calyx between the lobes. The fruit is a dry capsule.

1. ADENARIA H. B. K.

The only species, *A. floribunda* H. B. K., common in thickets or forests, is a shrub or tree of 2 to 6 meters with opposite, oblong-lanceolate, nearly sessile leaves, and small, 4 or 5-parted flowers. The wood is light yellow, moderately soft and light, and fine-grained. The local name is "fruta de pavo." In Colombia the plant is called "chaparral"; in Venezuela "guayabito."

2. CUPHEA Adans.

Bractlets none at base of calyx; leaves linear-oblong to narrowly oblanceolate. 1. **C. utriculosa** Koehne.
Bractlets (2) present at base of calyx; leaves ovate or elliptic.
  Calyx swollen below after anthesis; annual herb. 2. **C. balsamona** Cham. & Schlecht.
  Calyx not swollen after anthesis; plants perennial, suffrutescent. 3. **C. calophylla** Cham. & Schlecht.

At least one other species is known from Panama. Our plants are seldom much over 30 cm. high. The small flowers are 6-parted, usually axillary, with 2 or 6 purple petals and 11 or 9 stamens.

C. utriculosa, occasional here, is a common species in Central America, growing nearly always in dense clumps on rocks in streams. *C. balsamona* is a common weed. *C. calophylla* also is a common and more or less weedy species.

The name *Parsonsia* has been used for the genus.

3. ROTALA L.

Leaves mostly whorled, linear-oblong, 4 to 6 mm. long; capsule about 1.5 mm. long..............................1. **R. mexicana** Cham. & Schlecht.
Leaves opposite, oblanceolate or oblong, mostly 2 to 3 cm. long; capsule 3 mm. long..................................2. **R. ramosior** (L.) Koehne.

The Rotalas are small glabrous annuals, growing in bogs or other wet soil. The flowers are minute, solitary and sessile in the leaf axils. Both species are frequent here, at least on the Pacific slope.

4. AMMANNIA L.

Ammannia latifolia L. has been collected at Bella Vista. It is a glabrous annual of wet soil, with linear-oblong clasping leaves. The sessile, solitary or clustered, axillary flowers have no petals.

5. LAFOENSIA Vand.

The only Central American species, *L. punicifolia* DC., frequent in forests of the Pacific slope, is a slender tree of 5 to 15 meters with yellowish green, oblong-lanceolate leaves which have a conspicuous pore beneath at the apex. The large flowers with long red stamens and yellowish petals are racemose or panicled. The ovoid capsule is 3 to 4 cm. long or larger, containing broadly winged seeds. The wood is yellow, rather hard, heavy, strong, and fine-grained. It is reported to yield a yellow dye. In Panama the tree is called "amarillo"; in Salvador "trompillo" and "cuyapo"; in Guatemala "palo de culebra"; in Mexico "coquito" and "moreno."

6. LAWSONIA L. HENNA

The genus consists of a single species, *L. inermis* L., native of Africa and Asia. It is one of the commonly cultivated shrubs of Central America. The flowers, although not showy, are very fragrant, suggesting mignonette. In general appearance the plant reminds one of privet. In the Orient henna leaves are employed for dyeing the hair and beard and for staining the hands and feet yellow. A paste of the leaves applied to the hair or beard produces a bright red color, which is considered becoming among certain races of Mohammedans. Frequently, however, an indigo paste is next applied, and this turns the hair jet black. The flowers yield a perfume used in oils and ointments, and employed by the Egyptians in embalming. The name given to the plant in Panama, as well as elsewhere in Central America, is "reseda." The West Indians call it "mygonette."

7. LAGERSTROEMIA L.

Calyx glabrous; leaves mostly elliptic and 2 to 6 cm. long, sessile..1. **L. indica** L.
Calyx tomentose; leaves lanceolate or oblong, 10 to 20 cm. long, short-petioled. 2. **L. speciosa** (L.) Pers.

Lagerstroemia indica L., the crapemyrtle, native of Asia, is planted commonly in Central America. It is a glabrous shrub or small tree with showy, pink, purple, or white flowers having long-clawed crinkled petals. In Central America the current name is "Júpiter." In Mexico the plant is called "astronómica," "atmosférica," and "crespón." *L. speciosa* is a large tree, native of India, planted about the zone. The flowers are larger than in crapemyrtle, and vary from rose to purple.

107. PUNICACEAE. Pomegranate Family

The family consists of a single genus and species.

1. PUNICA L. POMEGRANATE

The pomegranate, *P. granatum* L., native of the Mediterranean region, is sometimes planted in Panama. It is a shrub or small tree with opposite, entire, elliptic or oblong, glabrous leaves and very showy, bright red flowers. The fruit is highly esteemed in some regions, but the pomegranate is little planted in Central America. The Spanish name for the fruit is "granada," a word often used as a place name in Spanish countries.

108. LECYTHIDACEAE. Brazilnut Family

Fruit fibrous or fleshy; calyx rupturing irregularly, or the lobes subvalvate; leaves oblanceolate or obovate, long-attenuate to the petiole.
  Leaves entire or nearly so; anthers dehiscent by longitudinal slits..1. **GRIAS.**
  Leaves serrate; anthers dehiscent by 2 apical pores..........2. **GUSTAVIA.**
Fruit woody; calyx lobes imbricate; leaves obtuse to broadly rounded at base.
  Seeds sessile, erect; leaves obtuse at base, 14 to 30 cm. long. 3. **ESCHWEILERA.**
  Seeds pendulous from fleshy funicles; leaves broadly rounded at base, mostly 40 to 50 cm. long....................................4. **LECYTHIS.**

The Lecythidaceae are shrubs or trees with alternate, entire or serrate leaves and no stipules. The perfect flowers are usually large and showy, with numerous stamens. The brazilnuts of commerce are the fruits of a tree of this family, *Bertholletia excelsa.*

1. GRIAS L.

The only Central American species is *G. fendleri* Seem., endemic in the forests of the Atlantic slope, and apparently rare. It is a glabrous tree with sessile leaves 40 to 60 cm. long. The short racemes are borne along the trunk, and the white flowers are 2.5 to 4 cm. broad.

2. GUSTAVIA L.

Gustavia superba (H. B. K.) Berg is one of the common and striking trees of wet forests, attaining a height of about 15 meters, but usually smaller. The few branches are densely leafy at the ends, and the short-petioled leaves are 30 to 100 cm. long. The flowers, in terminal racemes or clustered on the old naked branches, are 10 to 12 cm. broad, very handsome, with white or purple-tinged petals and yellow and purplish stamens. The fruit, which ripens in summer, is edible. The wood is said to be durable and to be used for building purposes. The vernacular name is "membrillo."

Several other species of *Gustavia* occur in Panama.

3. ESCHWEILERA Mart.

Several species grow in Panama, but the only one collected in our region is *E. calyculata* Pittier, which is found also in the Atlantic lowlands of Costa Rica. It has been collected in low forest near Fort Randolph, where it is a tree of 10 meters. The flowers are about 4 cm. broad and pale yellow. The fruit is depressed-globose, 7 cm. broad, opening by a woody lid and exposing the large seeds.

4. LECYTHIS L.

Several species are native in Panama. In Balboa there is growing a small tree of *L. tuyrana* Pittier, a species native in Darién, where it is a tree of 8 to 10 meters. A Brazilian species of *Lecythis* furnishes the sapucaia-nuts of commerce.

109. RHIZOPHORACEAE. Mangrove Family

Calyx 4-parted; fruit 1-seeded; leaves thick, obtuse--------1. **RHIZOPHORA.**
Calyx campanulate, 4 or 5-lobed; fruit 3-seeded; leaves thin, acuminate.
2. **CASSIPOUREA.**

No other representatives of the family are known from Central America. The plants are shrubs or trees with opposite short-petioled stipulate leaves, the perfect flowers having valvate sepals, 3 or 4 petals, and 4 to 30 stamens. The fruit is leathery and indehiscent or only tardily dehiscent.

1. RHIZOPHORA L. MANGROVE

The only American species is *R. mangle* L., the common mangrove, abundant in tidal swamps throughout tropical America, and occurring also in Africa. It is a glabrous shrub or tree, sometimes reaching a height of 25 meters but usually much smaller. The leaves are obovate to oblong, entire, and dark green. The flowers are borne in few-flowered clusters and have linear, pale yellow petals. The fruit is pendulous and 2 to 3 cm. long.

The mangrove forms characteristic dense forests in nearly all parts of the Central American coasts where there is land overflowed by salt water at high tide. About the zone it extends along the Canal to the locks, and forms extensive thickets in many places on the coasts. The plants have many arching prop roots, covered at high tide, and the mangrove swamps are almost impenetrable because of the interlacing stems. Oysters are often attached to the roots, hence a common and literally true statement that in the tropics oysters grow upon trees. The mangrove is of considerable importance in land building. The trees protect the land from erosion, and as they push farther out in shallow water, mud and debris lodge about the roots and new land is formed. The soil of mangrove swamps usually consists of black oozy mud, and such swamps are of repellent appearance when seen at close hand although when viewed from a distance their uniform appearance and their handsome green color make them most attractive.

The seed usually germinates in the fruit, the radicle growing downward 25 to 30 cm. before the fruit falls. The weight of the fruit causes the radicle to strike deeply into the mud, where a young plant is quickly developed.

The wood is dull red or reddish brown, very hard and heavy (specific gravity about 1.16), and fine-grained. It is used in tropical America for a wide variety of purposes. In Panama it is much esteemed for charcoal, and is said to furnish the very best quality of charcoal for use in the kitchen. The bark, which contains 20 to 30 per cent of tannin, is exported in large quantities from some regions for use in tanning skins. In Panama a red dye is obtained from the young shoots, and the bark with various salts of copper and iron gives olive, brown, and slate dyes.

In Panama as elsewhere in Spanish America the tree is called "mangle," and a mangrove swamp "manglar." Other names reported are "mangle salado" (Panama), "mangle gateador" (Costa Rica), and "mangle colorado" (Panama, Guatemala, Mexico).

2. CASSIPOUREA Aubl.

The only Central American species is *C. elliptica* Poir., a shrub or small tree, frequent in the region and often growing in mangrove swamps. The glabrous leaves are mostly elliptic and entire or with a few low distant teeth. The small flowers with hairy white petals are clustered in the leaf axils. In Darién this plant is known as "huesito" and "limoncillo."

110. COMBRETACEAE. Combretum Family

Flowers in dense globose conelike heads. Leaves alternate..1. **CONOCARPUS.**
Flowers in spikes or racemes.
  Leaves alternate; petals none.
    Calyx limb deciduous; branches unarmed............2. **TERMINALIA.**
    Calyx limb persistent; branches armed with spines..........3. **BUCIDA.**
  Leaves opposite; petals present.
    Calyx limb persistent; fruit obscurely 3-angled; plants erect; leaves thick and fleshy..................................4. **LAGUNCULARIA.**
    Calyx limb deciduous; fruit with 4 to 6 wings or sharp angles; plants scandent; leaves thin.
      Calyx tube short, constricted above the ovary; native species. 5. **COMBRETUM.**
      Calyx tube long and slender, not constricted; cultivated species. 6. **QUISQUALIS.**

The Combretaceae are trees or shrubs with entire leaves and no stipules. The flowers are perfect or unisexual, the calyx tube adnate to the ovary, its limb 4 or 5-lobed, the petals 4 or 5 or often none. The stamens are twice as many as the calyx lobes and inserted upon the limb or base of the calyx. The fruit is coriaceous or drupaceous, indehiscent, 1-celled and 1-seeded.

1. CONOCARPUS L. BUTTON-MANGROVE

The only species is *C. erecta* L. (pl. 59), a shrub or small tree, widely distributed in tropical America and occurring in Africa. It is one of the characteristic species of mangrove swamps, and does not grow elsewhere. The leaves are elliptic to oval, 3 to 10 cm. long, acute or obtuse, and have 2 small glands at the base. The conelike flower heads, about 1 cm. in diameter, are panicled. The grayish or yellowish brown, fine-grained, hard, heavy wood is used for general construction purposes and for charcoal. The bark is rich in tannin. The local name is "zaragoza," and the names "mangle piñuelo" and "mangle torcido" are reported from Panama. In Salvador the tree is called "botoncillo"; in Costa Rica "mariquito"; in Mexico "mangle negro," "estachahuite," "botoncahui," "mangle," and "mangle prieto"; in Cuba "yana" and "mangle botón."

2. TERMINALIA L.

Fruit broadly winged; leaves mostly 3 to 5 cm. wide, usually acute or acuminate. 1. **T. hayesii Pittier.**
Fruit not winged; leaves mostly 8 to 15 cm. wide, usually rounded and short-pointed at apex....................................2. **T. catappa** L.

The Terminalias are large trees with oblanceolate to broadly obovate, thin leaves, more or less pubescent beneath. The minute green flowers are borne in long spikes.

T. hayesii is a common tree in forests. One other closely related species is known from Panama, and it may be that two or more occur about the zone. For lack of adequate flowering and fruiting material the Central American species of *Terminalia* are imperfectly understood. *T. hayesii* is known at Chepo as "amarillo real." The tough wood is employed for construction purposes.

T. catappa, the India-almond, native of the East Indies and planted occasionally about the zone, is a good-sized tree with few whorled branches and large thin leaves. This tree is much planted in Central America, especially about the seaports, for it thrives in sand and endures salt. The Salvadoreans say that it is *un árbol muy agradecido* (a very grateful tree), for it flourishes with slight attention, and responds quickly to a little care. The fruits are obovoid, 2-edged, and 4 to 7 cm. long, the outside somewhat fleshy and containing a red juice. The seeds are rich in oil and edible, with a flavor suggesting filberts. In India the fruit is utilized for staining the teeth black. In Panama and elsewhere in Central American the tree is called "almendro."

3. BUCIDA L.

The only species is *B. buceras* L., a small tree growing in wet woods near the Atlantic coast. Sometimes it is only a shrub, and frequently it is found in strand thickets. The sharp spines of the branches are 2 to 3 cm. long. The leaves are obovate to elliptic, rounded at apex, and when young sparsely silky-pubescent. The small green flowers are spicate, the fruit an ovoid drupe 8 mm. long. The yellowish brown, hard, heavy, and close-grained wood is said to be durable and in some regions it is valued for construction purposes, while the bark is useful for tanning. In British Honduras this species is called "bullet-tree"; the Maya name is "pucté"; in Porto Rico the tree is called "úcar" and "búcaro," and in Cuba "júcaro."

4. LAGUNCULARIA Gaertn. WHITE-MANGROVE

The only species is *L. racemosa* (L.) Gaertn., the white-mangrove, sometimes called white buttonwood, another of the trees nearly always found in mangrove swamps, and frequent in such places about the zone. Widely distributed in tropical America and growing in western Africa, it is a tree, or often only a shrub, with leathery, oblong to oval, obtuse leaves, 4 to 8 cm. long, the petiole bearing 2 conspicuous glands at apex. The small flowers are arranged in clustered spikes. The leathery reddish fruit is 1.5 cm. long and whitish-pubescent. The yellowish brown, hard, strong, and heavy wood is valued for construction purposes, and the bark is employed for tanning. In Panama the tree is called "mangle blanco"; in Sinaloa "mangle chino"; in Cuba "mangle amarillo"; in the Dominican Republic "mangle prieto"; in Costa Rica "palo de sal"; and in Salvador "sincahuite."

5. COMBRETUM L.

Flowers small, the calyx limb about 2 mm. long; flower spikes not one-sided.
  Leaves glabrate beneath; spikes slender, distantly flowered.
    1. C. punctulatum Pittier
  Leaves copiously pubescent beneath; spikes stout, dense.
    2. C. jacquini Griseb
Flowers large, the calyx limb 5 to 15 mm. long; spikes one-sided.
  Calyx limb about 5 mm. long, lepidote; fruit broadly winged.
    3. C. farinosum H. B. K.
  Calyx limb 10 to 15 mm. long, sericeous; fruit sharply angled.
    4. C. coccineum (Aubl.) Engl. & Diels.

Other species grow in Panama. They are coarse woody vines with short-petioled, mostly oblong to oval, acute or acuminate leaves. The spicate flowers have small petals and conspicuous long-exserted stamens.

C. punctulatum is an endemic species, collected along the Trinidad River. The slender stems are armed with spines. *C. jacquini* (*C. epiphyticum* Pittier), growing on the Atlantic slope, has small, yellowish white, fragrant flowers.

C. farinosum (*C. superbum* Pittier and *C. lepidopetalum* Pittier are synonyms), frequent here and one of the common species of Central America, is very showy when in blossom, the large bunches of flowers giving a combination of greenish yellow and dark red. The winged fruits are nearly 2 cm. long and bright red. In Salvador the plant is called "peineta," "chupamiel," and "chupachupa"; in Mexico "carape," "compio" and "angarilla." The flowers, full of sweet nectar, are much visited by insects and hummingbirds. The tough flexible branches have been used for weaving baskets.

C. coccinea is a frequent and showy plant in swampy places on the Atlantic slope. The petals are pale red, and the stamens carmine and purple.

6. QUISQUALIS L.

Quisqualis indica L., sometimes called quisqual and Rangoon creeper, native of the East Indies, is planted for ornament. It is a slender vine with nearly glabrous, oblong, acute leaves, and drooping spikes of pink to red flowers 7 to 8 cm. long.

111. MYRTACEAE. Myrtle Family

Fruit capsular; leaves mostly alternate.................... 1. **EUCALYPTUS.**
Fruit baccate; leaves opposite.
  Calyx limb closed in bud or open but deciduous in age. Flowers solitary in the axils or in few-flowered cymes...................... 2. **PSIDIUM.**
  Calyx limb not closed in bud, the lobes imbricate, persistent.
    Ovary 4 or 5-celled; calyx lobes large and foliaceous. Pedicels solitary or clustered in the axils or at the ends of the branches.. 3. **CALYCOLPUS.**
    Ovary usually 2-celled; calyx lobes not foliaceous........... 4. **EUGENIA.**

Several other genera are represented in Panama. The Myrtaceae are shrubs or trees with entire, usually gland-dotted, often aromatic leaves and no stipules. The perfect regular flowers are subtended by 2 bractlets, and have a 4 or 5-lobed calyx, 4 or 5 petals, and numerous stamens. Well-known members of the family are the European myrtle, allspice (which is native in Central America and Mexico), and cloves.

1. EUCALYPTUS L'Hér. EUCALYPTUS

At least one species of this Australian genus is planted about the zone. A tree seen at Frijoles was without flowers, and its identification therefore doubtful.

2. PSIDIUM L. GUAVA

Leaves sessile; calyx open in bud.................. 1. **P. oerstedeanum** Berg.
Leaves short-petioled; calyx closed in bud.
  Calyx limb circumscissile but remaining attached to the tube by one side; leaves acute, the nerves not very prominent.
    2. **P. friedrichsthalianum** (Berg.) Benth. & Hook.
  Calyx not circumscissile, splitting at anthesis into several lobes; leaves obtuse, very strongly nerved.
    Lateral nerves of the leaves usually 12 pairs or more, parallel, close together, impressed above, the pubescence minute, whitish, usually appressed.
      3. **P. guajava** L.

Lateral nerves usually 7 to 10 pairs, remote, curved, not impressed above, the pubescence spreading, of brown or fulvous hairs.
4. P. molle Bertol.

The guavas have mostly oblong to elliptic leaves, and large white flowers. *P. oerstedeanum* grows in grassland on Ancón Hill and on Taboga. It is a simple or sparsely branched shrub, often with several stems 30 to 60 cm. high, and nearly glabrous leaves. The fruit is said to be about as large as a cherry and of good flavor. At El Boquete this species is called "guayabito arraiján," and on Taboga it is known as "guayabita del Perú." The Salvadorean names are "arrayán," "arrayana," and "guayabita rastrera."

P. friedrichsthalianum, which has been collected at Gamboa, is a small tree with glabrous leaves, and flowers 3 cm. broad. The globose fruit is smaller than in the common guava and has a tart flavor that makes it very good to eat. In Costa Rica the fruit is called "cas"; in Nicaragua "guayaba"; in Salvador "arrayán."

P. guayaba, the common guava, native in tropical America and cultivated throughout the tropics of the world, is abundant in pastures and rather dry thickets about the zone. On the Pacific slope of Central America it often forms extensive thickets of characteristic appearance known as "guayabales." The guava is a shrub or tree, sometimes 8 meters high, with peculiar pale brown, smooth bark that scales off in thin sheets. The fruit varies greatly in size, shape, color, and flavor, and has a musky odor that is remarkably penetrating. Raw it is somewhat insipid, but it makes excellent jelly, and is also prepared in other ways. In general, the fruit is little esteemed in Central America. The wood is brownish or reddish gray, hard, strong, elastic, close-grained, and durable, but the trees are too small to be of much use. The Spanish name for the fruit is "guayaba," for the tree "guayabo." The English name, "guava," is used by the Panamanians to designate species of *Inga*.

P. molle, occasional on the Pacific slope, is a shrub a meter high or less with small sour fruit. The local names are "guayabita," "guayaba arraiján," and "guayabito de sabana." Other names are "güísaro" (Costa Rica), "guayabillo" (Salvador), and "guayaba agria" (Mexico).

3. CALYCOLPUS Berg

The only Central American species is *C. warscewiczianus* Berg, a slender shrub, abundant in forests. The leaves are ovate to oblong-lanceolate, long-acuminate, and short-petioled, the flowers pink or whitish. In Panama and Costa Rica the shrub is called "guayabillo."

4. EUGENIA L.

Calyx tube obconic, the limb about 1.5 cm. wide.
  Flowers white, in terminal corymbs........................**1. E. jambos** L.
  Flowers rose-purple, in lateral racemes................**2. E. malaccensis** L.
Calyx tube hemispheric, the limb usually less than 1 cm. wide.
  Flowers subsessile, in elongate racemes; leaves about 30 cm. long.
3. E. zetekiana Standl.
  Flowers in short few-flowered racemes or corymbs; leaves mostly less than 10 cm. long.
    Flowers in open corymbs about as long as the leaves; leaves lanceolate.
4. E. sericiflora Benth.
    Flowers in short dense racemes; leaves mostly elliptic.
5. E. antiquae Riley.

Other species occur in Panama. The genus is a very large one in South America and the West Indies, but comparatively few species are known from Central America.

E. jambos, the "rose-apple," native of southeastern Asia but generally cultivated in tropical America as a shade tree and for its fruit, has become naturalized in forests about the zone. It is a very handsome tree, often 15 meters high, with a dense crown of deep green foliage, the large leaves narrowly lanceolate and glabrous. The flowers are conspicuous because of the dense cluster of long white stamens. The globose fruit, 3 to 4 cm. in diameter, is whitish or yellowish, with thin crisp hard flesh, and a large central cavity containing several seeds. It is sweet and has a characteristic flavor suggestive of rose water. It is not much esteemed in Central America and is eaten mostly by children, although sometimes it is offered in the markets. In Panama the tree is called "pomarosa," a name in common use elsewhere. The name "manzana rosa" is employed in some parts of Central America. The English name is malabar-plum.

E. malaccensis, the Malay-apple, an Asiatic species planted occasionally in the region, is one of the most attractive trees with which I am familiar. It is usually a low tree with very dense, rounded crown, the large leaves oblong-elliptic and glabrous. The bright purple flowers are exceptionally beautiful. They are borne within the leaves, and are not conspicuous when the tree is viewed from a distance, but the petals fall upon the bare soil beneath and form a lovely carpet. The fruit is obovoid, about 7 cm. long, suffused with red, and with white juicy flesh of excellent flavor. In Panama the fruit is called "marañón de Curasao," a not inappropriate name, since the fruit is strongly suggestive, in shape and color, of the cashew or marañón. The tree can not be recommended too highly for planting as a shade tree in tropical regions.

E. zetekiana is an endemic shrub of the Atlantic slope. *E. sericiflora* also is endemic, and a common shrub on Taboga Island, where it is called "coralillo." ***E. antiquae***, a frequent shrub on the Pacific slope, is known here as "paico."

112. MELASTOMACEAE. Melastome Family

Fruit a capsule; stamens usually unequal; plants herbaceous, rarely suffrutescent.
  Capsule 3-winged, obpyramidal. Flowers in one-sided spikes. **1. TRIOLENA.**
  Capsule not winged, terete or angled, not dilated above.
    Stamens very unequal; connective of the larger anthers with 2 elongate appendages.
      Lobes of the calyx much shorter than the tube__**2. ARTHROSTEMMA.**
      Lobes of the calyx nearly or quite as long as the tube. **3. ACISANTHERA.**
    Stamens subequal, the anthers all of about the same size, the connective merely biauriculate or bituberculate.
      Ovary glabrous at apex________________________________**4. ACIOTIS.**
      Ovary setose at apex.
        Calyx tube with 8 broad thick tuberculate-setose ribs. **5. SCHWACKAEA.**
        Calyx tube with very slender nervelike ribs.
          Calyx lobes alternating with penicillate-stellate bristles. **6. PTEROLEPIS.**
          Calyx lobes without intermediate bristles_____**7. TIBOUCHINA.**
Fruit baccate or coriaceous and rupturing irregularly; stamens equal or nearly so; plants shrubs or trees.
  Leaves pinnate-nerved_________________________________**18. MOURIRIA.**
  Leaves longitudinally 3 to 9-nerved.
    Leaves closely transverse-striolate between the primary nerves. Inflorescence axillary or lateral_____________________________**17. TOPOBEA.**

Leaves not striolate.
  Inflorescence terminal.
    Petals acute.......................................**8. LEANDRA.**
    Petals obtuse.
      Calyx limb calyptriform, circumscissile.........**9. CONOSTEGIA.**
      Calyx limb truncate or lobate, open in bud, not circumscissile.
        Outer calyx lobes none or inconspicuous.........**10. MICONIA.**
        Outer calyx lobes larger than the inner ones. **11. HETEROTRICHUM.**
  Inflorescence axillary or lateral.
    Petals acute.
      Peduncles axillary.......................................**12. OSSAEA.**
      Peduncles infra-axillary....................**13. HENRIETTELLA.**
    Petals obtuse.
      Inflorescence infra-axillary....................**14. HENRIETTEA.**
      Inflorescence axillary.
        Anthers linear-subulate, with 1 pore at apex.....**15. CLIDEMIA.**
        Anthers short, obtuse, with 2 pores..............**16. BELLUCIA.**

This is one of the largest families of tropical America. In Panama the shrubby species are conspicuous and abundant elements of the vegetation, often forming a large part of the undergrowth in the forests. The plants (except *Mouriria*) are easily recognized by their opposite leaves, which have 3 to 9 longitudinal nerves, arising at or near the base of the blade and continuing to the apex. The flowers are small or large and often showy, with white, pink, purple, or yellow petals. The stamens are as many or twice as many as the petals, the style simple, with a capitate stigma. The fruit is a 2 to many-celled capsule or a berry, and in the latter case is edible.

1. **TRIOLENA** Naud.

Triolena hirsuta (Benth.) Triana is reported as collected near Frijoles by Hayes, but it has not been found recently within our limits. It is a simple-stemmed herb about 30 cm. high with long-petioled, ovate, quintuplinerved, nearly glabrous leaves. The small white flowers are arranged in axillary and terminal, one-sided spikes.

2. **ARTHROSTEMMA** Ruiz & Pav.

Arthrostemma campanulare (Naud.) Triana is occasional in wet thickets or in swamps. It is an annual with brittle, nearly glabrous stems, long-petioled ovate 5-nerved serrulate leaves, and large pink flowers in terminal cymes. At Chepo the plant is called "hierba de agua."

3. **ACISANTHERA** Adans.

Leaves petioled; ovary 3-celled........................**1. A. quadrata** Juss.
Leaves sessile; ovary 2-celled................**2. A. limnobios** (DC.) Triana.

One other species, *A. recurva* (Rich.) Griseb., has been reported from the region, but has not been found here recently. The plants are small herbs, growing in wet places, with ovate serrulate 3-nerved leaves and small pink flowers. *A. quadrata* is frequent on the Pacific slope, and *A. limnobios* has been found at Alhajuela.

4. **ACIOTIS** Don

Aciotis paludosa (Mart.) Triana is frequent in swamps on the Atlantic slope. It is a large herb with brittle winged stems, petioled, ovate, 5-nerved, nearly entire, sparsely hairy leaves, and small white flowers in terminal panicles.

5. **SCHWACKAEA** Cogn.

The genus consists of a single species, *S. cupheoides* (Benth.) Cogn., ranging from Panama to southern Mexico, and a common weed about the zone. It is an annual with branched reddish stems, short-petioled ovate entire 3-nerved leaves, and small pink sessile axillary flowers. The calyx has 8 prominent ribs. In Salvador the plant is called "sulfatillo," "sulfato de la tierra," and "pollito."

6. **PTEROLEPIS** Miquel

Pterolepis trichotoma (Rottb.) Cogn. is a common plant on the Pacific slope, usually growing in savannas. It is a slender, very hairy annual with lanceolate or ovate, 3-nerved, entire leaves and small, pink, axillary and terminal flowers.

7. **TIBOUCHINA** Aubl.

Tibouchina longifolia (Vahl) Baill., one of the most common plants of the region, is herbaceous or suffrutescent, usually about a meter high, with hairy lanceolate 5-nerved leaves and small inconspicuous white flowers. In Guatemala the plant is called "mosqueta silvestre."

Several other species are known from Panama.

8. **LEANDRA** Raddi

Leaves cordate or subcordate at base; flowers 6 or 7-parted.
1. L. mexicana (Naud.) Cogn.
Leaves rounded or obtuse at base; flowers 4 or 5-parted.
  Pubescence of the stems of long appressed hairs.
  2. L. secundiflora (Mart. & Schr.) Cogn.
  Pubescence of the stems of long spreading hairs.
  3. L. dichotoma (Don) Cogn.

The Leandras are pubescent shrubs with long-petioled, ovate or elliptic, 5 or 7-nerved, crenate-serrate leaves and small flowers in terminal panicles.

L. mexicana is occasional on the Atlantic slope. Its flowers are pink and the fruit purple-black. *L. secundiflora* has been collected near Frijoles, and *L. dichotoma* in the same region.

9. **CONOSTEGIA** Don

Branchlets setose or stellate-setose with long spreading hairs.
  Leaves 5-nerved; branchlets setose with simple hairs. **1. C. bracteata** Triana.
  Leaves 5-plinerved; branchlets setose with stellate-tipped hairs.
  2. C. speciosa Naud.
Branchlets finely and closely stellate-scurfy.
  Leaves 5-plinerved, usually densely stellate-scurfy beneath and white or brownish .... **3. C. xalapensis** (Bonpl.) Don.
  Leaves 7 to 11-plinerved, sparsely stellate-scurfy beneath and green.
  4. C. subcrustulata (Beurl.) Triana.

Other species are known from the mountains of Panama. They are shrubs or small trees with ovate to oblong, entire or toothed, petioled leaves and mostly small, white or pink flowers in terminal panicles.

C. bracteata is a shrub, occasional in the Atlantic forests. *C. speciosa* is one of the common shrubs of the whole region, its flowers pink and the fruit purple-black. The vernacular names are "dos caras," "raspa-lengua," "fruta de pava," and "quita-manteca," the last probably given because the hairy leaves are used to clean greasy dishes.

C. xalapensis is probably the most common representative of the Melastomaceae in Mexico and Central America. In this region it seems to be confined to the Atlantic watershed, where it is plentiful, usually growing in well-drained soil. It is a large shrub or a tree of 10 meters, conspicuous because of its bicolored leaves and showy pink flowers. The small globose fruit, dark blue or purple, sweet, and of good flavor, is much eaten and is sometimes seen in Central American markets. In Chiriquí the plant is called "canillito," and the name "quieravangué" is reported from the Río Fató. In Salvador the name used is "cirín"; in Costa Rica "lengua de vaca," "purré," and "escobillo"; in Nicaragua "capiroto"; in Mexico "capulincillo," "nigua," "capulín," and "teshuate."

10. MICONIA Ruiz & Pav.

Leaves sessile and more or less clasping at base, finely stellate-pubescent beneath, large, 3 or 5-plinerved.
Anthers subulate; leaves abruptly contracted below.
1. **M. amplexans** (Crueger) Cogn.
Anthers short-linear; leaves not contracted toward the base.
2. **M. impetiolaris** (Swartz) Don.
Leaves petioled, the petiole sometimes margined.
Leaves covered beneath with a very dense, brown or white tomentum, 3 or 5-nerved.
Leaves mostly 10 to 15 cm. wide------------3. **M. argentea** (Swartz) DC.
Leaves mostly 3 to 7 cm. wide.
Leaves densely brown-tomentose beneath; flowers not secund.
4. **M. rubiginosa** (Humb. & Bonpl.) DC.
Leaves white-tomentose beneath; flowers secund.
Leaves shallowly cordate or emarginate at base.
5. **M. albicans** (Swartz) Triana.
Leaves obtuse or rounded at base-----------6. **M. stenostachya** DC.
Leaves green beneath, glabrous or variously pubescent but not tomentose.
Petioles margined to the base-------------------7. **M. pteropoda** Benth.
Petioles not margined.
Leaves hirsute or setose beneath. Leaves 5 or 7-plinerved.
Leaves attenuate at base-------------8. **M. nervosa** (Smith) Triana.
Leaves rounded at base.
Branches long-setose; flowers secund.
9. **M. lacera** (Humb. & Bonpl.) Naud.
Branches short-setose and finely scurfy-pubescent; flowers not secund.
10. **M. ibaguensis** (Humb. & Bonpl.) Triana.
Leaves glabrate beneath, the pubescence, if any, minute and scurfy.
Leaves ciliate, 5-nerved-----------------11. **M. ciliata** (Rich.) DC.
Leaves not ciliate.
Leaves 3 or 5-nerved.
Leaves rounded at base, mostly 2.5 to 4 cm. wide; anthers truncate.
12. **M. minutiflora** (Humb. & Bonpl.) DC.
Leaves acute or obtuse at base, mostly 5 to 8 cm. wide; anthers not truncate--------------------13. **M. beurlingii** Triana.
Leaves 3 or 5-plinerved.
Anthers subulate. Leaves obtuse at base.
14. **M. gatunensis** Pittier.
Anthers short-linear.
Leaves rounded at base--------------15. **M. alternans** Naud.
Leaves acute at base------------16. **M. lonchophylla** Naud.

The genus is the largest of the family, abundantly represented in Central America, and numerous other species occur in Panama. The Miconias are shrubs or small trees with entire or toothed leaves and small, 4 to 8-parted, usually white flowers in terminal panicles. The fruit is a small edible berry, usually dark blue, purple, or black.

M. amplexans is a South American species reported as collected on Lion Hill by Hayes. *M. impetiolaris* is one of the common shrubs or small trees of the region. The leaves are brownish beneath. The local names are "dos caras" and "oreja de mula"; the Costa Rican name is "hoja de pasmo."

M. argentea is one of the most abundant small trees of the Atlantic slope, plentiful nearly everywhere but especially on the lake shores. The leaves are deep green above and white beneath. When the wind is blowing the white under surfaces become visible, and viewed from a distance, the trees appear to be covered with white flowers. The local name, "dos caras" (two faces), is an allusion to the coloring of the leaves. Other names given to the tree in Panama are "canillo," "oreja de mula," "cainillo," "papelillo," and "mancha-mancha." In Salvador it is called "sirinón"; in Costa Rica "María," "Santa María," and "capilote"; in Nicaragua "capirote blanco"; in Tabasco "cenizo" and "sabano." The wood is brown, moderately hard, durable, and fine-grained.

M. rubiginosa, which has been found here only on Taboga, is a shrub or tree of 2 to 7 meters. At Aguadulce it is called "friega-platos" and in Chiriquí "canillo." The wood is said to be hard and durable, and useful for fence posts. *M. albicans*, frequent on the Pacific slope, is known in Darién as "plateado," and in Colombia as "mortiño." *M. stenostachya*, occasional on the Pacific side, is closely related to *M. albicans* and perhaps not distinct. The local name is "dos caras."

M. pteropoda is an occasional shrub or small tree in thickets and forests, and *M. nervosa* is of infrequent occurrence on the Atlantic slope. *M. lacera* is a common shrub, easily recognized by the long, dark red hairs on all parts. The vernacular name in Guatemala is "sirín." *M. ibaguensis* occurs on the Pacific slope and is known as "fruta de pava" and "dos caras." *M. ciliata* has been found here only on Ancón Hill.

M. minutiflora is a slender shrub or small tree, nearly if not altogether confined to the Pacific watershed. In Costa Rica this species is known as "resino." *M. beurlingii* is frequent in the Atlantic forests and *M. gatunensis* is an endemic species of the Atlantic slope. *M. alternans* is said to have been collected here by Hayes. *M. lonchophylla* is occasional on the Atlantic slope.

11. **HETEROTRICHUM** DC.

Heterotrichum ocotonum (Humb. & Bonpl.) DC., occasional in forests and thickets, is a shrub with long-setose stems, and broadly ovate, 7 or 9-nerved leaves, cordate at base and stellate-pubescent beneath. The rather large, white flowers are arranged in small, chiefly terminal panicles. The fruit is purplish black. In Salvador the shrub is called "peluda" and "hoja peluda."

12. **OSSAEA** DC.

Flowers densely clustered in the leaf axils or on naked branches.
1. **O. trichocalyx** Pittier.

Flowers in small lax axillary panicles.
Flowers 5-parted; branches densely furfuraceous.
2. **O. diversifolia** (Bonpl.) Cogn.
Flowers 4-parted; branches glabrate____3. **O. micrantha** (Swartz) Macfad.

At least one other species occurs in Panama. The plants are shrubs with broad, 5 to 9-plinerved leaves, furfuraceous-pubescent beneath, and abruptly long-decurrent at base. The small flowers are pink or reddish, and the juicy fruit black or purple.

O. trichocalyx, endemic in Panama, occurs in wet forests on the Atlantic slope. *O. diversifolia* is a frequent shrub and bears the local name of "fruta de pava." *O. micrantha* has been collected on Barro Colorado Island.

13. **HENRIETTELLA** Naud.

Henriettella seemannii Naud. was described from specimens collected by Seemann near Las Cruces. It grows elsewhere in Panama and in Costa Rica, but has not been found recently in our region. It is a tree of 4.5 to 10 meters with oblong-elliptic 3-nerved hispidulous leaves and small flowers clustered on naked branches or in the leaf axils.

14. **HENRIETTEA** DC.

Henriettea succosa (Aubl.) DC., the only Central American species, has been found on Ancón Hill. It is a shrub or small tree with large, short-petioled, broadly obovate, quintuplinerved leaves, roughly stellate-pubescent beneath. The rather large, pinkish flowers are short-pediceled and clustered on naked branches.

15. **CLIDEMIA** Don

Branchlets strongly compressed; leaves of a pair very unequal, the smaller one bractlike..**1. C. gracilis** Pittier.
Branchlets not compressed; leaves of a pair equal or only slightly unequal.
  Flowers 4-parted.
    Flowers in small lax cymes; leaves minutely scurfy-puberulent or glabrate..**2. C. petiolata** (Rich.) DC.
    Flowers sessile and clustered in the leaf axils; leaves densely setulose. **3. C. rubra** (Aubl.) Mart.
  Flowers 5 or 6-parted.
    Flowers in small few-flowered panicles little longer than the petioles; inner teeth of the calyx obsolete.
      Leaves obtuse at base; branches densely short-setose..**4. C. dentata** Don.
      Leaves broadly rounded or subcordate at base; branches thinly long-setose..**5. C. hirta** (L.) Don.
    Flowers in many-flowered panicles, these usually over half as long as the leaves; inner calyx lobes evident.
      Branches glandular-pilose with rather short hairs...**6. C. neglecta** Don.
      Branches with very long, mostly glandless hairs..**7. C. dependens** Don.

Other species occur in Panama. The Clidemias are slender shrubs, usually with ovate, 5 to 7-nerved leaves, and small whitish flowers in axillary panicles. The calyx often has an inner series of lobes. The fruit is a small berry.

C. gracilis is an endemic species, known only from the Gatún Valley. *C. petiolata* is occasional in the Atlantic forests. *C. rubra*, common on the Pacific slope, is usually a simple shrub, with red or pink flowers and black or purple, edible fruit. The vernacular names are "fruta de pava" and "hoja peluda." *C. dentata* is frequent on the Atlantic slope. *C. hirta* is a frequent shrub of the region. It is said to be known in Nicaragua as "grosella azulada," in Colombia as "mortiño," and in Porto Rico as "camacey." *C. neglecta* is frequent in forests. In Chiriquí it is called "hoja peluda." *C. dependens* grows on the Pacific slope.

16. **BELLUCIA** Neck.

Bellucia grossularioides (L.) Triana grows in forests of the Atlantic slope. It is a small tree with quintuplinerved elliptic-ovate leaves 15 to 20 cm. long, brown-tomentose beneath when young. The large white flowers are clustered on naked branches; the fruit is a large edible yellow berry.

17. **TOPOBEA** Aubl.

Leaves sparsely stellate-furfuraceous beneath, 20 to 30 cm. long, rounded at base; flowers fascicled, pedicellate .... **1. T. superba** Naud.
Leaves glabrous, 9 to 12 cm. long, acutish at base; flowers solitary, subsessile. **2. T. regeliana** Cogn.

The Topobeas are shrubs or trees with elliptic-ovate, 5 or 7-nerved leaves, and large flowers clustered in the leaf axils or on naked branches. *T. superba* is reported to have been collected at Colón by Hayes, and *T. regeliana* was based upon specimens collected at Chagres by Fendler, but neither species has been found here recently.

18. **MOURIRIA** Aubl.

Mouriria parvifolia Benth., occasional in the Atlantic forests, is a slender glabrous shrub or small tree with sessile entire ovate pinnate-nerved leaves and small axillary flowers. In Salvador it is called "camarón" and "capulín verde," and in Panama "arracheche." In general appearance the species of *Mouriria* are very unlike the other Central American members of the Melastomaceae.

113. ONAGRACEAE. Evening-primrose Family

The genera *Fuchsia* and *Lopezia* are represented in the mountains of Panama. Forms of some of the South American species of *Fuchsia* are cultivated commonly about the zone.

1. **JUSSIAEA** L.

Plants floating in streams; leaf blades nearly or quite as broad as long, glabrous. **1. J. natans** H. B. K.
Plants terrestrial, sometimes growing in water but rooted and erect; leaf blades much longer than broad.
Capsule 4-angled, short. Seeds in several series in each cell.
Capsule with narrow wings along the angles .. **2. J. decurrens** (Walt.) DC.
Capsule not winged.
Leaves mostly lanceolate .... **3. J. erecta** L.
Leaves linear .... **4. J. lithospermifolia** Kunth.
Capsule terete, elongate.
Seeds pluriseriate in the cell, each seed with an enlarged raphe, this simulating a sterile cell. Flowers 4-parted .... **5. J. suffruticosa** L.
Seeds uniseriate, with a small inconspicuous raphe.
Flowers 4-parted .... **6. J. linifolia** Vahl.
Flowers 5-parted.
Stems pilose with long spreading hairs; leaves usually narrow-lanceolate .... **7. J. leptocarpa** Nutt.
Stems crisp-puberulent or short-pilose; leaves mostly ovate or elliptic. **8. J. affinis** DC.

Other species occur in Panama. The *Jussiaeas* are small or large herbs, or sometimes small shrubs, with alternate entire leaves. The showy flowers are axillary, with inferior ovary, 4 to 6 green sepals, and as many yellow petals. The fruit is a cylindric or prismatic, 4 to 6-celled capsule, containing numerous small seeds. The plants usually grow in wet soil.

J. natans is a common floating plant of the Chagres River and Gatún Lake. Most of the other species are common weeds. *J. suffruticosa* is one of the most common weeds of tropical America, known in Costa Rica as "clavelillo"; in Salvador as "flor de Santa Cruz," "sulfatillo," and "sanangujo."

114. ARALIACEAE. Ginseng Family

Leaves simple, entire or lobed........................1. **DENDROPANAX**
Leaves compound.
  Leaves digitately compound........................2. **DIDYMOPANAX.**
  Leaves pinnate, bipinnate, or pinnate-ternate.
    Leaves two or more times pinnate-ternate; native species.
3. **SCIADODENDRON.**
    Leaves once or twice pinnate; cultivated species.....4. **NOTHOPANAX.**

Oreopanax and perhaps other genera are represented in the mountains of Panama. The Araliaceae are shrubs or trees with alternate, simple or compound, stipulate leaves. The small greenish flowers are borne in usually panicled umbels. The calyx is adnate to the ovary, its limb truncate or toothed; there are usually 5 petals. The fruit is a berry, containing 2 to 12 1-seeded nutlets.

1. **DENDROPANAX** Decaisne & Planch.

The only species in the Canal Zone is *D. arboreum* (L.) Decaisne & Planch. (*Gilibertia arborea* March.), a large shrub or small tree, common in woods and thickets about the zone. The long-petioled leaves vary greatly in outline. On flowering branches they are mostly oblong to oval or broader; on young shoots they are commonly 3-lobed. The whitish flowers are small and inconspicuous, the black fruits 6 to 8 mm. in diameter. The name "vaquero" is reported in use for this species in Panama. In Salvador a closely related species is called "mano de león"; in Costa Rica "cacho de venado"; in Mexico "mano de oso," "palo de danta," and "palo santo"; in Cuba "palo cachimba"; in Porto Rico "pana," "palo cachumba," and "muñeca." The fibrous, rather heavy, yellow wood, with reddish heartwood, is little used.

2. **DIDYMOPANAX** Decaisne & Planch.

Didymopanax morototoni (Aubl.) Decaisne & Planch. is a common forest tree, attaining sometimes a height of 30 meters. The leaves are composed of 7 to 10 long-stalked, oblong or obovate, entire, acuminate leaflets. On large trees the leaflets are pale beneath and covered with a dense tomentum, but on young plants they are green on both sides, without tomentum, but hispid on the upper surface. The panicles are 20 to 60 cm. long, the small petals white, the compressed 2-celled fruit glaucous.

In Panama the tree is called "mangabé" and "gargorán"; in both Panama and Costa Rica "pava" or "pavo"; in Porto Rico "yagrume" and "pana cimarrona"; in Cuba "cordován"; in Venezuela "yarumo." The wood is light, soft, rather brittle, not durable, and rather close-grained. It is reported as a suitable substitute for pine and spruce in general carpentry, interior construction, boxes, and paper pulp.

Another species, *D. pittieri* March., of very different aspect, occurs in Chiriquí.

3. **SCIADODENDRON** Griseb.

The only species of the genus, *S. excelsum* Griseb., ranges from Colombia to Salvador, and is common on the Pacific slope of Panama. It is a large shrub or a tree, sometimes 9 meters high, usually with few thick branches, the bark smooth and pale. The large leaves, often a meter long, are composed of numerous small ovate serrate glabrous leaflets. In Panama the tree is called "jobo de lagarto," and the name "mangabé" was given me for it, perhaps erroneously. In Salvador it is called "lagarto" or "corroncho de lagarto." The petioles are employed in Panama for making bird cages.

4. NOTHOPANAX Miquel

Leaves twice pinnate..............................1. **N. fruticosum** (L.) Miquel.
Leaves once pinnate.
  Leaflets 11 to 17, green..............................2. **N. ornatum** (Bull.) Merrill.
  Leaflets 5 or 7, usually margined or blotched with white.
    3. **N. guilfoylei** (Cogn. & Marché) Merrill.

The species are probably natives of Polynesia or the East Indies, but they are scarcely known in the wild state. They are cultivated commonly for ornament in tropical regions. About the zone they are among the most abundant of cultivated plants, and are planted nearly everywhere for hedges.

N. fruticosum has leaflets bordered with white and often much cut or parted so that the leaves have a plumelike appearance. *N. ornatum* is little planted. Of *N. guilfoylei* there are several forms, one of which with leaflets green, rather than white-edged, is (according to Merrill) perhaps *N. pinnatum* Miquel. In cultivation the plants seldom flower.

115. APIACEAE. Parsley Family

Flowers in dense headlike spikes; teeth of the leaves with spinelike tips.
    1. **ERYNGIUM.**
Flowers in umbels; teeth of leaves obtuse or rounded.
  Leaves peltate..............................2. **HYDROCOTYLE.**
  Leaves not peltate..............................3. **SPANANTHE.**

This family is a large one in temperate regions, but in the lowlands of Central America it is represented only by a few weedy species. The plants are usually easy of recognition because of their small umbellate flowers and peculiar fruit. The leaves are alternate, without stipules, and simple in the species enumerated below. The flowers have an inferior ovary, 5 petals, 5 stamens, and 2 styles. The fruit consists of 2 one-seeded carpels which separate at maturity.

To this family belong numerous cultivated plants, such as parsley ("perejil"), fennel ("eneldo"), celery ("apio"), coriander ("culantro"), carrot ("zanahoria"), anise ("anís"), and parsnip ("chirivía"). All these, with the exception of parsnips, are cultivated in Central America, especially in the cooler regions.

1. ERYNGIUM L.

Eryngium foetidum L., a common weed about the zone, is a low glabrous herb with a basal rosette of oblanceolate or spatulate, coarsely toothed leaves, the stem leaves being few-toothed or 3-lobed. The small dense heads of greenish flowers are subtended by leaflike bracts. The plant, especially its root, has a strong, characteristic, and offensive odor. The leaves, however, are much used in Central America for flavoring soups and other dishes, to which they impart an agreeable flavor.

In Panama the plant is called "culantro" and "culantro coyote"; in Salvador "acapate"; in Porto Rico "culantro de monte." The Jamaicans of the zone call the plant "spiritweed," and the Barbadians "fitweed," the latter name being applied because of its use as a remedy for "fits."

2. HYDROCOTYLE L.

Umbels compound..............................1. **H. bonariensis** Lam.
Umbels simple.
  Petioles glabrous; flowers long-pedicellate..............................2. **H. umbellata** L.
  Petioles villous; flowers nearly sessile..............................3. **H. costaricensis** Rose.

Other species are known from Panama. The plants of the genus are small herbs with creeping stems and long-petioled, peltate (in ours), shallowly scalloped, orbicular leaves. The small greenish flowers are borne in long-stalked umbels.

H. bonariensis was collected at Chagres by Fendler. *H. umbellata* is of rare occurrence here, growing in mud or at the edge of water. *H. costaricensis* has become established as a weed in the Powell Orchid Garden at Balboa. It is a native of the mountains of Costa Rica, and probably grows also in those of Panama, whence it has been brought with orchid plants to the garden.

H. umbellata is known in Costa Rica as "sombrerito," and in Salvador as "lechuga."

3. **SPANANTHE** Jacq.

Spananthe paniculata Jacq. is a common weed in many parts of Central America, but in our region it has been noted only at Gatuncillo. It is a branched glabrous herb with heart-shaped or deltoid, crenate or serrate leaves and few-flowered axillary umbels of small greenish flowers.

A species of *Clavija* (without specific name), of the family Theophrastaceae, is reported by Hemsley from the zone, but the plant has not been collected here recently. At least two species of the genus are known from Panama, and the genus *Jacquinia* also is represented in the Republic.

116. MYRSINACEAE. Myrsine Family

Flowers fasciculate in the leaf axils........................1. **RAPANEA.**
Flowers paniculate.
  Corolla pubescent outside........................2. **PARATHESIS.**
  Corolla glabrous outside.
    Style short and stout; ovules uniseriate................3. **STYLOGYNE.**
    Style elongate and slender; ovules pluriseriate................4. **ARDISIA.**

The Myrsinaceae are shrubs or small trees with alternate, entire or toothed leaves, without stipules, and punctate or lineolate. The small perfect flowers are white or pink, 4 or 5-parted, with inferior calyx. The petals are usually united, the corolla being rotate, the 4 or 5 stamens opposite the corolla lobes and attached to them. The fruit is a small globose berry or drupe, usually black or dark purple at maturity, and often edible.

1. **RAPANEA** Aubl.

Rapanea pellucido-punctata (Oerst.) Mez, which occurs in thickets near Panama City, is a glabrous tree of 4.5 to 6 meters, with oblong-elliptic or lance-elliptic, acutish leaves 7 to 12 cm. long. The globose green fruits are about 3 mm. in diameter. At Chepo the tree is called "mangle de sabana"; in Costa Rica "ratoncillo" and "sierra."

There is some uncertainty about the specific name of the Panama plant. The species of *Rapanea* have been multiplied to such an extent, and are based on such slight characters, that probably half a dozen other names are quite as applicable to the Panama species.

2. **PARATHESIS** Hook. f.

Parathesis serrulata (Swartz) Mez is a shrub, found in forests along the Río Tecumen. It has tomentose branchlets and oblong-lanceolate acuminate serrulate leaves 10 to 20 cm. long and more or less stellate-tomentulose beneath. The small pink flowers are borne in terminal panicles. The black-purple fruit is about 7 mm. in diameter. In Nicaragua the shrub is said to be called "cugía"; in Chiapas "cinco negritos"; in Porto Rico "rasca-garganta" and "seca-garganta"; in the Dominican Republic "jalapón."

3. **STYLOGYNE** DC.

Inflorescence terminal............................1. **S. laevis** (Oerst.) Mez.
Inflorescence axillary or lateral....................2. **S. ramiflora** (Oerst.) Mez.

The plants are glabrous shrubs with large, thick, acuminate, elliptic to oblong leaves, the white or pinkish flowers arranged in small panicles whose branches are bright red. The black fruits are about 5 mm. in diameter. *S. laevis* is known in Chiriquí as "uvito."

Mez has described from the zone *S. hayesii*, but it is doubtful whether this is distinct from *S. ramiflora*.

4. **ARDISIA** Swartz

Leaves closely pectinate-serrate; low shrub, usually less than a meter high.
1. **A. myriodonta** Standl.
Leaves entire; tall shrubs.
  Flowers in panicled racemes; leaves obovate or oblong-obovate, obtuse.
2. **A. revoluta** H. B. K.
  Flowers in panicled corymbs; leaves mostly elliptic, acuminate.
3. **A. compressa** H. B. K.

Other species occur elsewhere in Panama. The plants are glabrous or nearly glabrous shrubs or small trees with small, white or pinkish flowers. The name *Icacorea* is sometimes used for the genus.

A. myriodonta is known only from Barro Colorado Island.

A. revoluta, common in thickets and forests on the Pacific slope, reaches a height of 6 meters or more, but is usually smaller. The thick, dark green leaves are 10 to 20 cm. long; the white flowers, borne in great profusion in large panicles, are rather showy. The black fruit resembles a small cherry, and its scant pulp is juicy and of good flavor. In Panama the tree is called "uvito," "margarita," and "fruta de pava." In Costa Rica it is called "guastomate," "fruta de pava," and "tucuico"; in Salvador "uva" and "cerezo"; in Mexico "laurel," "pimientilla," "capulín," and "negrito." The wood is employed in Panama for posts and the framework of huts.

A. compressa is a slender shrub of sparing occurrence, found here chiefly on the Pacific slope. The thin leaves are mostly about 10 cm. long, but sometimes much larger. The white or pinkish flowers, in smaller panicles than those of *A. revoluta*, are very handsome. In Costa Rica the plant is called "tucuico" and "murta"; in Salvador "cerezo," "cerecilla," and "cotomate"; in Mexico "laurelillo," "capulín silvestre," and "capulincillo."

117. PRIMULACEAE. Primrose Family

1. **CENTUNCULUS** L.

The Panama representative of this genus and family, *C. pentandrus* R. Br., is an inconspicuous slender glabrous annual, 5 to 15 cm. high, usually almost hidden by other plants among which it grows. It is plentiful in wet savannas of the Pacific slope. The alternate entire leaves are oval to rounded, 3 to 10 mm. long. The minute axillary pedicellate flowers have 5 united sepals, 5 petals about 1 mm. long, and 5 stamens. The fruit is a 1-celled capsule 2 mm. in diameter, containing numerous seeds.

Plumbago scandens L., of the family Plumbaginaceae, has been reported from Panama. *P. capensis* Thunb., the common cultivated plumbago, native of South Africa, with white or pale blue flowers, is grown as an ornamental plant. In Salvador it is called "umbela" and "lumbela."

118. SAPOTACEAE. Sapodilla Family

Leaves sparsely or densely sericeous beneath.
  Calyx segments subequal, not biseriate; leaves broadest at the middle. **1. CHRYSOPHYLLUM.**
  Calyx segments unequal, biseriate; leaves broadest above the middle. **2. LABATIA.**
Leaves usually glabrous or glabrate, not sericeous beneath.
  Ovary 9 to 12-celled; flowers mostly solitary in the leaf axils...**3. ACHRAS.**
  Ovary 4 to 9-celled; flowers usually fasciculate in the axils or lateral.
    Ovary 6 to 9-celled; leaves thick, rounded at apex........**4. MIMUSOPS.**
    Ovary 4 or 5-celled; leaves thin, usually acute or acuminate.
      Sepals 8 to 10; flowers lateral on old wood..........**5. CALOCARPUM.**
      Sepals 4 to 6; flowers axillary............................**6. LUCUMA.**

Other genera represented in Panama are *Bumelia* and *Sideroxylon.* The Sapotaceae are trees, often with milky sap, the leaves alternate, entire, petioled, without stipules, and usually persistent. The small perfect flowers are axillary or lateral, whitish or greenish, with 4 to 12 imbricate sepals, and a gamopetalous corolla which often bears appendages between the lobes. The stamens are as many as the corolla lobes and borne upon the corolla, often alternating with sterile stamens or staminodia. The fruit is a large berry or drupe.

1. CHRYSOPHYLLUM L. Star-apple

Leaves densely brown-sericeous beneath; fruit several-seeded ..**1. C. cainito** L.
Leaves very sparsely sericeous beneath with pale hairs; fruit 1-seeded. **2. C. panamense** Pittier.

The plants have elliptic or oblong-elliptic, acuminate leaves and small flowers clustered in the leaf axils or on naked branches.

C. cainito, the well-known star-apple and one of the common fruits of Central America, is planted nearly everywhere about the zone, and is plentiful in the forests, where it often attains a height of 20 meters or more. The tree is easily recognized by its handsome leaves, deep green and glabrous above, covered beneath with a lustrous satiny pubescence. The fruit resembles a small apple, with smooth, green or purple skin, and greenish milky flesh. When cut transversely the several brown seeds suggest the points of a star, hence the common name. The pulp is sweet and the fruit is much eaten, although it is rather insipid.

The star-apple makes one of the handsomest shade trees. The pinkish or reddish brown, moderately hard and heavy wood is used for general construction purposes. Almost everywhere in Central America the star-apple is called "caimito." The Barbadians of the zone know it also as "star-plum."

C. panamense, an endemic species of the Atlantic slope, is a medium-sized tree with leaves 10 to 20 cm. long.

2. LABATIA Mart.

Labatia standleyana Pittier (*Lucuma standleyana* Pittier) is a small tree endemic on the Atlantic slope. Its oblong-oblanceolate acuminate leaves are 10 to 20 cm. long, and densely grayish-sericeous beneath. The small flowers are subsessile in the leaf axils; the young fruits are hairy.

Another species, *L. sambuensis* Pittier, has been described from Darién.

3. **ACHRAS** L. SAPODILLA

Outer sepals 7 to 8 mm. long; leaves mostly about 10 cm. long, obtuse or acute.
1. A. zapota L.

Outer sepals 5.5 mm. long; leaves mostly 12 to 18 cm. long, acuminate.
2. A. calcicola Pittier.

The plants are trees with oblanceolate or elliptic-oblong, thick leaves, glabrous or nearly so.

A. zapota, the sapodilla, is planted here frequently, especially on Taboga Island, and may be native in Panama. It is well known throughout Central America. It is a handsome tree, sometimes 20 meters high, with a dense rounded crown of dark green leaves, and milky sap. The fruit is globose or ovoid, 6 cm. or more in diameter, with thin, scaly or smooth, brown skin, and sweet, soft flesh. There are from 1 to 12 brown or black, smooth and shining seeds imbedded in the pulp. The fruit is highly esteemed in Central America, and by some foreigners is considered the best of all the native fruits. The usual name for the fruit throughout Central America is "níspero." In Mexico it is called "zapote" and "chicozapote."

The most valuable product of the tree is its gum, known as "chicle," used in the preparation of chewing gum. It is obtained by tapping the trees or pressing the fruit. Large amounts are exported from southern Mexico and Guatemala. It should be noted, however, that chicle is obtained also from the other species of *Achras* which have been described from Central America. The trees are tapped during the rainy season, V-shaped cuts being made in the trunk, from which the milky sap is collected in small vessels. The sap is condensed by heating over a fire, then kneaded with a stick and made into small cakes for export. It is reported that a large tree will yield as much as 20 pounds of gum in a season. About 5,000,000 pounds are produced annually in Mexico.

The wood is hard, slightly heavier than water, dark reddish, and fine-grained. It is esteemed for the manufacture of carts and for many other purposes.

A. calcicola Pittier, an endemic species, described from Alhajuela, is a tree of 15 to 25 meters, with a trunk often a meter in diameter. The local name is "níspero."

4. **MIMUSOPS** L.

Mimusops darienensis Pittier is endemic in Panama, and grows upon both slopes of the zone. It is a large tree, reaching a height of 50 meters and a trunk diameter of 1.5 meters. The thick leaves are elliptic or obovate, 8 to 15 cm. long, with numerous slender lateral nerves. When young they are brown-tomentose beneath, but in age they are nearly glabrous. The numerous flowers are borne on long pedicels; the fruits are ovoid, smooth, and about 3 cm. long, containing a single large seed.

The tree is of great economic importance, being the source of the "balata" gum or gutta-percha exported from Panama. This is obtained by tapping the trunk, as in the case of chicle. A similar product is obtained in various parts of South America from other species of the genus. The sap of one of the Brazilian species of *Mimusops* is used as a food, a substitute for milk, which it resembles in appearance. The wood of the Panama species is reported as brownish red, heavy, and fine-grained. It is used for construction purposes and is said to be very durable.

Mimusops darienensis is known by the name of "níspero." The names "bullet-wood" and "bully-tree" are applied to some species of the genus.

5. **CALOCARPUM** Pierre. SAPOTE

Calocarpum mammosum (L.) Pierre, the sapote, one of the best-known fruit trees of tropical America, perhaps native of southern Mexico, is planted frequently about the zone and is occasionally found wild, probably an escape from cultivation. It is a large tree, sometimes 30 meters high, with milky sap, the deciduous leaves short-petioled, oblanceolate or obovate, 15 to 30 cm. long or larger, sparsely pubescent or glabrate beneath. The small flowers are sessile or nearly so. The fruit is globose or ovoid, 8 to 20 cm. long, with rough brown skin and pink or reddish flesh, in which is imbedded a single large brown shining seed.

The fruit is much eaten in Central America, and is liked by many persons. The flesh is sweet but rather insipid, like that of so many tropical fruits. The fruit is usually eaten raw but is sometimes made into marmalade or other "dulces." The ground seeds are used for flavoring chocolate and candy and other sweetmeats. The oil of the seeds was esteemed by the Aztecs for dressing the hair, and the seeds are employed also in domestic medicine.

The wood is light reddish, hard and heavy, and medium-textured. It is little used because the trees are protected for their fruit.

In Panama, strangely enough, the sapote is called "mamey," or "mamey de tierra," to distinguish it from the true mamey (*Mammea americana*). Everywhere else in Central America, as well as usually in Mexico, it is known as "zapote" (from the Aztec *tzapotl*).

6. **LUCUMA** Molina

Leaves acute or acuminate, thin, mostly 12 to 15 cm. long.
1. **L. salicifolia** H. B. K.

Leaves rounded at apex, thick, mostly 6 to 10 cm. long.
2. **L. serpentaria** H. B. K.

Two other Lucumas are known from Panama. Our species are small or medium-sized trees with glabrous leaves and inconspicuous pubescent flowers.

L. salicifolia has been collected at Ancón, presumably in cultivation. It has lanceolate or oblanceolate leaves. The fruit is globose or ovoid, 7.5 to 12 cm. in diameter, orange-yellow at maturity, with reddish yellow pulp in which are imbedded 3 or 4 dark brown seeds. This species is native in southern Mexico, where it is called "zapote amarillo," "zapote borracho," and "zapote de niño." In Costa Rica, where it is planted, it is known as "zapotillo." The fruit is edible but apparently little valued. There is in Mexico a popular belief that it produces drowsiness, hence the name "zapote borracho"

L. serpentaria is a Cuban species. There is a tree about 6 meters high growing in Balboa.

The genera *Styrax*, of the family Styracaceae, and *Symplocos*, of the Symplocaceae, are represented in the mountains of Panama.

119. OLEACEAE. Olive Family

1. **JASMINUM** L. JASMINE

The Arabian jasmine, *J. sambac* (L.) Soland., native of Asia, is planted commonly about the zone, especially as a hedge plant, and it is a favorite ornamental in most parts of Central America. It is an erect shrub with opposite or ternate, ovate, more or less pubescent leaves, and terminal clusters of pure white, long-tubed, starlike, sweet-scented flowers. The flowers are often double. In Panama this jasmine is called "jazmín"; in Salvador "gemela" (the double form), "jazmín de papel," and "jazmín de azahar."

120. LOGANIACEAE. Logania Family

Plants woody, usually scandent; fruit baccate, globose........1. **STRYCHNOS.**
Plants herbaceous; fruit a didymous capsule.
  Capsule circumscissile....................................2. **SPIGELIA.**
  Capsule deeply 2-lobed, dehiscent vertically along the inner side of the lobes.
3. **CYNOCTONUM.**

The genus *Buddleia* also is represented in Panama. The plants of this family are shrubs or herbs with opposite entire leaves, with or without stipules. The regular flowers are perfect, with a 4 or 5-lobed calyx and a gamopetalous, 4 or 5-lobed corolla, the stamens as many as the corolla lobes and alternate with them. The ovary is 2-celled.

1. STRYCHNOS L.

Branches glabrous, puberulent, or hirtellous with short hairs; corolla pruinose-puberulent.
  Leaves thin, mostly 4 to 8 cm long; branchlets glabrous or hirtellous.
1. **S. panamensis** Seem.
  Leaves coriaceous, mostly 12 to 16 cm. long; branchlets puberulent with minute subappressed hairs....................2. **S. darienensis** Seem.
Branches hirsute with long hairs; corolla hirsute..........3. **S. toxifera** Benth.

The species of *Strychnos* are widely distributed in the Tropics of both hemispheres. Five species have been reported from Central America and one from Mexico. They are slender woody vines, sometimes provided with tendrils and having broadly ovate to lanceolate, 3 or 5-nerved, acute, entire leaves. The white or yellowish flowers are about 2 cm. long, in terminal or axillary cymes, the corolla salverform, with long slender tube and 5 short lobes. The fruit is globose and indehiscent, usually 4 cm. or more in diameter, with hard, green or yellow shell, and containing few or numerous large compressed seeds.

From *S. nux-vomica* L., of India, are extracted the drugs nux-vomica and strychnine, and many if not all the other species contain similar principles.

S. panamensis (pl. 60) was described from Taboga Island and is very common in forests about the zone, ranging northward at least to Salvador. It is a large, nearly glabrous vine with white flowers which are produced during the rainy season. The fruits vary from 4 to 8 cm. in diameter. On Taboga Island this species is called "canjura," and at the Tapia River I was given the name "fruta de murciélago" for it. In Salvador the names used are "guacamico," "huacal de mico," and "huacamico."

S. darienensis has been collected on the Atlantic slope.

S. toxifera, frequent in the wet forests of the Atlantic slope, is easily distinguished from *S. panamensis* by the copious pubescence on all parts. This species has not been found north of Costa Rica, but ranges southward to Brazil. In some parts of Brazil it is called "urari," and it is famous as one of the sources of curare one of the deadliest poisons known. Introduced into the circulation in minute quantities, it paralyzes the motor nerves almost instantly, and soon causes death. Curare is obtained from the bark and roots. It has been employed extensively by the South American Indians for poisoning their arrows, especially those shot from blowguns, and it is reported that similar use of the plant is made by the Indians of Panama.

2. SPIGELIA L.

Capsule muricate; stems terete..........................1. **S. anthelmia** L.
Capsule smooth; stems more or less evidently 4-angled.
2. **S. humboldtiana** Cham. & Schlecht.

The Spigelias are low, weedy, nearly glabrous herbs with simple or branched stems and opposite, lanceolate, entire, acute or acuminate, sessile or short-petioled leaves. *S. anthelmia* is an annual, but *S. humboldtiana* appears to be a perennial. The upper leaves are usually in whorls of 4. The small whitish flowers, 5 to 10 mm. long, are arranged in one-sided spikes, terminal or in the forks of the branches. The corolla is salverform, with 5 lobes, the fruit a small, 2-celled, slightly compressed capsule.

Both species are common in moist shady places about the zone. *S. anthelmia* is called "lombricera" in Porto Rico, and in the British West Indies "worm-grass." Probably the former name is used also in Central America. The roots of the plant have long been used in tropical America (where both species are widely distributed) as a remedy for tapeworms and other parasites. Only small doses must be used, however, since in larger quantities the plant is said to produce vomiting, convulsions, and death. It is reported that the plant has been used for criminal poisoning. On Taboga Island I was told that the seeds—but not other parts of the plant—were poisonous to goats and other animals.

S. humboldtiana is known in Salvador as "lombricera" and "lombricilla." This species is used in Central America as a remedy for tapeworms, and probably has the same properties as *S. anthelmia.*

3. CYNOCTONUM Gmel. MITERPOD

Cynoctonum mitreola (L.) Britton is common about the zone, usually in moist soil, often as a weed in waste places. It is a slender glabrous annual with ovate entire leaves and minute (about 2 mm. broad) white flowers arranged in one-sided spikes in terminal and axillary cymes. The 2-lobed capsule, about 3 mm. long, resembling a bishop's miter, makes the plant easy of recognition.

121. GENTIANACEAE. Gentian Family

Plants without chlorophyll; leaves reduced to scales..........1. **LEIPHAIMOS.**
Plants green; leaves not reduced to scales.
  Stigma capitate.
    Flowers clustered in the leaf axils....................2. **ENICOSTEMA.**
    Flowers in cymes or corymbs.
      Leaves linear; plants annual; flowers 5 to 7 mm. long......3. **CURTIA.**
      Leaves lance-oblong; plants perennial; flowers about 5 cm. long. 4. **LISIANTHUS.**
  Stigma bilamellate.
    Flowers in dense elongate spikes; corolla white.........5. **COUTOUBEA.**
    Flowers not spicate; corolla pink or green.
      Corolla green; style persistent; flowers in long one-sided racemes. 6. **CHELONANTHUS.**
      Corolla pink; style deciduous; flowers not racemose.
        Stamens spirally curved in age..................7. **CENTAURIUM.**
        Stamens not curved..............................8. **SCHULTESIA.**

Other genera represented in Panama are *Symbolanthus* and *Eustoma.* The Gentianaceae are large or small, glabrous herbs with opposite entire leaves (reduced to scales in *Leiphaimos*), without stipules. The flowers are regular and perfect, with gamopetalous corolla, as many stamens as corolla lobes and inserted alternate with them on the tube or throat, and superior, 1-celled or partially 2-celled ovary. The fruit is a 2-celled capsule containing numerous seeds.

1. LEIPHAIMOS Schlecht. & Cham.

Leiphaimos simplex (Griseb.) Standl. is found occasionally in wet dark forests, growing among fallen leaves. It is a very slender, weak herb with white stems 6 to 12 cm. long, bearing a few pairs of scales and a terminal flower with tube 8 mm. long and 5-lobed, pale blue limb 6 to 8 mm. broad. The plant is probably a saprophyte, living upon decayed vegetable matter, and in habit and aspect resembles the United States species of *Thalesia.*

Several other species of *Leiphaimos* are known from Panama.[17]

2. ENICOSTEMA Blume

Enicostema verticillatum (L.) Engler has been collected on the Atlantic slope. It is a coarse perennial herb with lanceolate 3-nerved leaves and dense clusters of small white flowers.

3. CURTIA Cham. & Schlecht.

Curtia tenella (Mart.) Cham. grows in grassland on Ancón Hill and Taboga Island. It is a slender annual, 10 to 25 cm. high, corymbosely branched above, with few white flowers. The name "clavel de San Jacinto" was given for the plant on Taboga. The plants when growing are inconspicuous and nearly hidden among grasses.

4. LISIANTHUS L.

Lisianthus skinneri (Hemsl.) Kuntze is reported by Hemsley as collected by Fendler, but it has not been found recently. It is a large herb with leaves 10 to 15 cm. long, the flowers in lax cymes. One other species is known from Panama.

5. COUTOUBEA Aubl.

Coutoubea spicata Aubl., the only North America species, is common in moist situations. It is a large herb with simple or branched stems and sessile, oblong to lance-linear leaves. It is reported that in Veraguas a decoction of the roots is administered as a febrifuge.

6. CHELONANTHUS (Griseb.) Gilg

Chelonanthus alatus (Aubl.) Standl. (*Lisianthus alatus* Aubl.) is occasional in thickets and on open banks. It is a coarse herb, 1 to 2 meters high, with ovate or lanceolate leaves. The racemes are arranged in cymes, the flowers about 2 cm. long.

7. CENTAURIUM Hill

Centaurium quitense (H. B. K.) Robinson (*Erythraea quitensis* H. B. K.) is of infrequent occurrence in moist fields. It is a slender branched annual with oval to linear-oblong leaves and bright pink flowers 1 cm. long.

8. SCHULTESIA Mart

Flowers about 12 mm. long; calyx lobes not winged.
1. **S. lisianthoides** (Griseb.) Benth. & Hook.
Flowers 15 to 50 mm. long; calyx lobes narrowly or broadly winged on the keel.
  Corolla 4 to 5 cm. long; bracts at base of flower equaling or longer than the calyx ---------- 2. **S. heterophylla** Miquel.
  Corolla 2 cm. long; bracts much shorter than the calyx.
3. **S. guianensis** (Aubl.) Malme.

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[17] See Standley, Contr. U. S. Nat. Herb. **20**: 194–200. 1919.

One other species has been found in Panama. The plants have a salverform or funnelform corolla.

S. lisianthoides is a common weedy species with sessile, obovate or oblong leaves, glaucous inflorescence, and numerous unattractive, dirty pink flowers. In Salvador it is called "sulfatillo" and "sulfato de tierra," and is said to be employed as a remedy for malaria.

S. heterophylla grows in wet savannas on the Pacific slope. It is an annual, 30 to 60 cm. high, with linear leaves, the stems simple and bearing a few large, bright pink flowers. It is one of the handsomest flowers of the region, and in favorable locations sometimes occurs in great abundance. The flowers vary from pale pink to deep rose. They are at their best in early morning, and close about noon.

S. guianensis grows in moist grassy places on the Pacific slope. In spite of its large flowers the plant is not very attractive, since the corolla is of a dull dirty pink. In Salvador this species is called "canchalagua," "hierba de la vida," and "sulfatillo." Seemann states that both these large-flowered species were known in Panama as "canchalagua."

122. MENYANTHACEAE. Bogbean Family

The family is represented in Central America by a single species.

1. NYMPHOIDES Hill

Nymphoides humboldtianum (H. B. K.) Kuntze (*Limnanthemum humboldtianum* Griseb.) is of occasional occurrence in quiet water. It is a glabrous aquatic herb with long-petioled, entire, orbicular or reniform leaves 4 to 12 cm. broad. The white flowers are borne in umbels on the petiole, a character by which the plant may be recognized immediately. The 5-lobed corolla is 1.5 cm. long, its lobes finely fringed. The fruit is a small, irregularly dehiscent capsule.

123. APOCYNACEAE. Dogbane Family

Leaves alternate. Erect shrubs or trees.
  Corolla salverform; carpels of the fruit many-seeded, dehiscent. **1. PLUMERIA.**
  Corolla funnelform; carpels 1 or 2-seeded, indehiscent ----- **2. THEVETIA.**
Leaves opposite or verticillate.
  Leaves all or mostly verticillate. Shrubs or trees.
    Plants scandent; corolla yellow; fruit spiny ----------- **3. ALLAMANDA.**
    Plants erect; corolla white or pink; fruit not spiny.
      Fruit baccate; native species ---------------------- **4. RAUWOLFIA.**
      Fruit dry; cultivated species ------------------------- **5. NERIUM.**
  Leaves opposite.
    Anther cells not appendaged at base. Plants erect.
      Plants woody; calyx glandular within; fruit fleshy, usually indehiscent. **6. TABERNAEMONTANA.**
      Plants herbaceous; calyx not glandular; fruit dry, dehiscent. **7. LOCHNERA.**
    Anther cells appendaged at base and sometimes at apex. Plants scandent or erect.
      Tips of anthers exserted from the corolla.
        Plants erect; seeds naked ---------------------- **8. MALOUETIA.**
        Plants scandent; seeds with a tuft of hairs at apex ---- **9. PRESTONIA.**
      Tips of anthers not exserted. Plants scandent.
        Corolla salverform, with slender tube --------------- **10. ECHITES.**

Corolla funnelform.
  Calyx without glands; corolla pink; leaves obtuse or rounded at apex. **11. RHABDADENIA.**
  Calyx glandular within; corolla yellow, sometimes dark red within; leaves acuminate.
    Plants glabrous or nearly so; leaves obtuse or acute at base. **12. ODONTADENIA.**
    Plants hirsute or hirtellous; leaves cordate at base. **13. MANDEVILLA.**

The Apocynaceae are shrubs or trees, rarely herbs, often climbing, with milky sap and entire, opposite, whorled, or alternate leaves, without stipules. The perfect regular flowers are usually in cymes and often large and showy. The 5-lobed calyx is often glandular within at base. The gamopetalous corolla is salverform or funnelform, the 5 stamens, inserted on the tube or throat of the corolla, with short filaments and narrow, often connivent anthers. The fruit consists of 2 carpels or pods which are dry or fleshy, and either dehiscent or indehiscent.

1. **PLUMERIA** L. FRANGIPANI

Corolla white .... 1. **P. acutifolia** Poir.
Corolla red or purple .... 2. **P. rubra** L.

The Plumerias are large shrubs or small trees with few very thick branches and copious milky sap. The petioled leaves are thick, oblong to ovate, glabrous or nearly so, and 15 to 40 cm. long or larger. They are usually deciduous, and the plants often bloom when leafless. The large (4 to 7 cm. long) flowers, in terminal cymes, are showy and handsome. The follicles of the fruit are thick and 10 to 25 cm. long.

Both species are planted for ornament about the zone. They are natives of Mexico, although *P. acutifolia* is native also along the Pacific coast of Central America, perhaps as far south as Panama. One of the Ancón streets is called Frangipani Avenue, after these flowers.

P. acutifolia sometimes attains a height of 10 meters. In Panama it is called "caracucha" or "caracucha blanca"; in Costa Rica "cacalojoche" and "juche;" in Nicaragua "sacuanjoche" and "flor de palo;" in Salvador "flor de la cruz," "flor de ensarta," and "flor de mayo; "in Mexico "cacaloxóchitl," "cacalosúchil," "súchil" and "flor de cuervo." The sweet-scented flowers are much used for decorations. In Salvador the corollas of this and other species are strung on strings into chains which are used to decorate altars, especially on the 3d of May, the feast of flowers, or Day of the Cross. Upon this occasion it is the custom to erect in every home a cross, which is handsomely decorated with flowers and other objects.

The names "templeflower" and "graveyardflower" are sometimes given to this and other species, the latter name because of the fact that in the Pacific Islands, where it has been introduced, this species is frequently planted in cemeteries. The name frangipani is derived from the French *frangipanier*, coagulated milk, in reference to the thick white sap. This sap is said to yield a good quality of rubber, and it is used locally for treating wounds and venereal diseases.

The flowers of *P. rubra* are smaller than those of *P. acutifolia*. In Panama the former species is said to be called "caracucho," "caracucha colorada," and "palo de la cruz"; in Porto Rico "alelí"; in Cuba "lirio colorado"; in Nicaragua "flor de toro."

2. THEVETIA Adans.

Leaves linear, 1 cm. wide or less................1. **T. peruviana** (Pers.) Merr.
Leaves oblanceolate-oblong or obovate, 3 to 10 cm. wide.
2. **T. nitida** (H. B. K.) A. DC.

The Thevetias are large shrubs or small trees with thick fleshy leaves and large (4 to 7 cm. long) yellow funnelform flowers. The fruit is a fleshy drupe, 3 to 6 cm. broad, broader than long, and slightly compressed, containing 2 large seeds.

T. peruviana (*T. neriifolia* Juss.), planted here for ornament, is perhaps native in Mexico or Central America, and is common in cultivation. It sometimes attains a height of 10 meters, but is usually smaller. The narrow glabrous leaves are 7 to 15 cm. long, the large flowers showy and handsome. In Panama the tree is called "campanilla" and "amancay." Other vernacular names are "chirca" (Costa Rica, Guatemala), "chilca" (Nicaragua, Guatemala), "chilindrón," "campanilla amarilla" (Salvador), "caballón," "cabalonga" (Porto Rico), "pepa de cruz," "castañeto" (Colombia), "lengua de gato" (Venezuela). In Florida (where it is planted) the tree is known as "trumpetflower" and "yellow oleander," and in the British West Indies as "lucky-nut" and "lucky-seed." The latter names are given probably because the seeds are carried in the pocket as talismans. The wood is soft and fibrous, the flowers sweet-scented. The milk and seeds are reported poisonous. In Yucatán cotton soaked in the sap is placed in cavities of the teeth to relieve toothache. The seeds are reported to yield a glucoside, thevetine, and a tincture of the bark is said to be a powerful febrifuge, in large doses a violent emetic and purgative.

T. nitida is a common shrub of 1 to 3 meters, growing in woods or thickets. The large leaves are handsome and glossy, the fruit bright red and showy. In Panama this species is called "cojón de gato," "lavaperro," and "huevo de tigre"; in Mexico "ojo de venado," "lecherillo," and "venenillo." It is reputed to be very poisonous.

3. ALLAMANDA L.

Allamanda cathartica L., the only North American species, is frequent in swampy woods and is planted for ornament. It is a large woody vine with glabrous or hairy stems, obovate-oblong leaves 10 to 18 cm. long, mostly in whorls of 3 or 4, and bright yellow, trumpet-shaped flowers 7 to 9 cm. long. The fruit is orbicular, compressed, 4 to 6 cm. broad, covered with long stout spines. The plant is very showy when in flower, and is extensively planted in warm regions. In Guatemala it is called "amanda"; in Porto Rico "canario" and "cantiva." The Americans of the zone call the flowers "buttercups."

4. RAUWOLFIA L.

Rauwolfia heterophylla Roem. & Schult., occasional in thickets of the Pacific slope, is a shrub of 1 to 2 meters, with mostly whorled, obovate to oblong, nearly glabrous leaves 5 to 10 cm. long. The greenish-white flowers, 2.5 mm. long, are borne in chiefly axillary cymes. The juicy fruit, 6 to 8 mm. in diameter, is red at first but purple-black at maturity. On Taboga the shrub is called "veneno"; in Nicaragua "guataco colorado," "comida de culebra," and "viborilla"; in Costa Rica "guataco"; in Salvador "amatillo," "hierba de San José," "señorita," and "matacoyote"; in Mexico "sarna de perro" and "cocotombo." The fruit is reputed poisonous, which is not improbable. The plant finds some use in domestic medicine, and the juice of the fruit has been employed as ink and for dyeing.

R. multiflora Riley, recently described from the Pacific slope, is scarcely distinct from *R. heterophylla*.

5. NERIUM L. Oleander

The common oleander, *N. oleander* L., native of the Mediterranean region, is grown commonly in Central America, and is planted frequently about the zone. The flowers are white or pink and often double. In Central America the oleander is known usually as "narciso" (narcissus). Other names are "laurel rosa," "laurel blanco" (Mexico, Porto Rico); "adelfa" (Mexico, Porto Rico); "flor de la Habana" (Colombia). The plant contains alkaloids which act as a powerful cardiac poison, and have been employed in medicine as a heart tonic and stimulant. It has long been used in southern Europe for killing rats and sometimes for poisoning people.

6. TABERNAEMONTANA L.

Corolla bright yellow; calyx lobes foliaceous, about 1.5 cm. long.
Stemmadenia → 1. **T. grandiflora** Jacq.
Corolla white; calyx lobes not foliaceous, 5 mm. long or less.
  Corolla tube about 1 cm. long; native species..........2. **T. arborea** Rose.
  Corolla tube about 2.5 cm. long; cultivated species.
3. **T. divaricata** (L.) R. Br.

At least one other species is known from Panama. The plants are shrubs or trees, glabrous or nearly so in our species, with oblong to obovate leaves, and small or large flowers in cymes.

T. grandiflora is a shrub of 2 to 4 meters, frequent in woods and thickets, with showy flowers about 5 cm. long. The plant is known in Panama as "huevo de gato," "lechuga," and "venenillo." *T. arborea*, occasional in the Atlantic forests, reaches a height of 15 meters, with a trunk diameter of 30 cm. The wood is yellowish or light reddish brown, hard, heavy, and fine-grained.

T. divaricata, probably of East Indian origin, is planted for ornament here as well as elsewhere in Central America. The handsome flowers are usually double. In Salvador this species is called "jazmín de Arabia," and "jazmín de Jamaica." Another species of *Tabernaemontana*, as yet undetermined, is planted for hedges about the zone, and is called "varita de San José." It has white flowers, with a slender corolla tube about 2 cm. long.

7. LOCHNERA Reichenb.

Lochnera rosea (L.) Reichenb. (*Vinca rosea* L.; *Catharanthus roseus* Don) is planted as an ornamental and is found wild occasionally. It is probably a native of the Old World, but is cultivated and naturalized in the American tropics. Although essentially an annual, it often persists for several years, even becoming somewhat woody under favorable conditions. It is a slightly pubescent plant with oblong to obovate, obtuse leaves, the flowers axillary, solitary or in twos, with handsome white or pink corollas 3 cm. long. The fruit consists of 2 slender pods 2 to 3 cm. long. In Panama the plant is known as "jazmín" and "chavelita." Other names are "chula," "mulata" (Salvador); "mulatilla," "chuladita," "clavellina" (Honduras); "maravilla de España" (Mexico); "cortejo" (Colombia); "flor de todo el año" (Porto Rico); "vicaria," "Dominica" (Cuba). In the United States and the British West Indies the plant is called "vinca," "periwinkle," and "old maid." In Honduras an infusion of the plant is employed as a gargle for sore throat.

8. MALOUETIA A. DC.

The only Central American species, *M. guatemalensis* (Muell. Arg.) Standl., is a small glabrous tree, frequent in swampy woods of the Atlantic watershed. The elliptic acuminate leaves are 10 to 20 cm. long, the small (12 mm. long) white flowers in dense axillary clusters. In Nicaragua the tree is reported to reach a height of 12 meters.

9. PRESTONIA R. Br.

Leaves densely hirsute beneath; corolla tube hirsute.
1. **P. ipomaeifolia** A. DC.
Leaves glabrous or puberulent beneath; corolla tube glabrous or nearly so.
  Leaves glabrous; calyx about 15 mm. long.
    Leaves oblong or elliptic, green beneath........2. **P. macrocarpa** Hemsl.
    Leaves obovate, pale beneath.....................3. **P. obovata** Standl.
  Leaves densely puberulent beneath; calyx 6 to 7 mm. long.
4. **P. exserta** (A. DC.) Standl.

The Prestonias are climbing shrubs with short-petioled, oblong to ovate or obovate leaves and large flowers in pseudo-axillary cymes. The calyx is 5-parted, with foliaceous lobes, the corolla salverform. The fruit consists of 2 divergent or parallel pods.

P. ipomaeifolia is a large vine with yellow flowers 2.5 cm. long, frequent in thickets of the Pacific slope. The divaricate pods are 9 cm. long and densely hispid. *P. macrocarpa* is common on the Atlantic slope. Its corollas are nearly 3 cm. long, greenish outside, dull purple within, with yellow throat. The incurved terete glabrous pods are 25 to 35 cm. long and 5 mm. thick. *P. obovata* is an endemic species of the Atlantic slope, and *P. exserta* is occasional in thickets. Its greenish yellow flowers are about 2 cm. long.

10. ECHITES Jacq.

Calyx lobes obtuse or rounded at apex; leaves glabrous....1. **E. trifida** Jacq.
Calyx lobes acuminate; leaves usually pubescent beneath.
2. **E. microcalyx** A. DC.

The plants are slender climbing shrubs with oblong to elliptic, short-petioled leaves and axillary racemes. The fruit consists of 2 long slender pods which are often constricted between the seeds.

E. trifida is common in thickets. The corolla has a green and reddish tube 2.5 to 3 cm. long and greenish white lobes. *E. microcalyx*, occasional here, has a corolla of about the same size, but greenish yellow with reddish throat. The name "flor de mico" is reported for this species in Guatemala.

Another species is known from Chiriquí, *E. peltata* Vahl, remarkable for its very large and broad, fleshy, peltate leaves. It is known by the name "cuíngara."

11. RHABDADENIA Muell. Arg.

Rhabdadenia paludosa (Vahl) Miers grows about mangrove swamps on the Atlantic slope. It is a small woody vine with oval to oblong-linear, glabrous, fleshy leaves and few-flowered racemes of handsome pink flowers 6 to 7 cm. long. The fruit consists of 2 long slender pods. In Cuba this species is called "clavelito." The milky sap is said to blister the skin and to have purgative or even poisonous properties.

12. ODONTADENIA Benth.

The only Central American species, *O. speciosa* Benth., occasional in the Atlantic forests, is a large woody vine with short-petioled, oblong to elliptic, glabrous leaves 15 to 30 cm. long. The yellow flowers are about 5 cm. long, in large cymes. The name "negrillo" is given to the plant in Panama.

13. MANDEVILLA Lindl.

Mandevilla tomentosa (Vahl) Kuntze, frequent in thickets of the Atlantic slope, is a small slender hairy vine with oblong to elliptic leaves, cordate at base and caudate-acuminate at apex. The villous or silky corolla is 6 to 7 cm. long, pale yellow outside, with a blood-red throat. The long, slender pods are more of less hairy, and constricted between the seeds. In Guatemala the plant is called "bejuco de culebra."

124. ASCLEPIADACEAE. Milkweed Family

Plants erect, herbaceous; flowers red and orange............1. **ASCLEPIAS.**
Plants scandent, herbaceous or woody; flowers variously colored but not red and orange.
  Leaves cordate at base.
    Corona ringlike, shallowly lobed................2. **VINCETOXICUM.**
    Corona of 5 scales....................................3. **ROULINIA.**
  Leaves acute to rounded at base.
    Corona adnate to the corolla.......................4. **FUNASTRUM.**
    Corona adnate to the gynostegium.
      Corolla salverform.................................5. **MARSDENIA.**
      Corolla rotate or campanulate.
        Corona scales thin, flat; flowers 2.5 mm. long..6. **METASTELMA.**
        Corona scales cucullate; flowers about 6 mm. long.7. **BLEPHARODON.**

It is probable that several other genera are represented in Panama. The plants are erect or climbing, herbaceous or woody, with milky sap, the leaves opposite and entire, without stipules. The perfect regular flowers are usually arranged in umbel-like or raceme-like cymes, and are of extremely complicated and highly specialized structure. The calyx is 5-lobed, the corolla gamopetalous, 5-lobed, and varying from saucer-shaped to salverform. Within the corolla there is usually a corona, which is united with the corolla or with the stamen tube. The 5 stamens have short connate filaments; the anthers are connivent about the stigma, forming with that and the filaments the gynostegium, and the pollen is usually coherent in masses known as pollinia. The ovary consists of 2 distinct carpels, the stigma usually forming a 5-angled disk. The fruit consists commonly of a single dehiscent pod, containing numerous seeds which usually have a terminal tuft of hairs.

1. ASCLEPIAS L. Milkweed

The only Panama species is *A. curassavica* L., a common weed of tropical America, plentiful about the zone. It is a coarse herb with petioled, oblong or lanceolate leaves, and showy umbels of purple-red and orange flowers. In Panama this species is called "pasorín," and "niño muerto"; in Costa Rica and other regions "viborana"; in Salvador "sangrís" and "señorita"; in Honduras "vinorama"; in Mexico, among other names, "calderona." The Barbadian name was given as "four-o'clock," but this is a meaningless term, as applied to the present plant, and probably incorrect. In Honduras the milky sap is employed as a remedy for intestinal worms. The dried latex is said to cause sneezing.

A form with flowers orange-yellow throughout is of rare occurrence in Central America.

2. VINCETOXICUM Walt.

Corolla long-pilose within, about 6 mm. long ______ 1. **V. pinguifolium** Standl.
Corolla papillose within or short-pilose, 12 to 25 mm. long.
  Corolla lobes attenuate, merely papillose within; leaves broadest at base. 2. **V. dubium** (Pittier) Standl.
  Corolla lobes obtuse, short-pilose within; leaves narrowed at base. 3. **V. viridiflorum** (Meyer) Vail.

The plants are slender herbaceous vines with long-petioled, oblong to rounded-ovate, deeply cordate leaves, and axillary umbels of yellow, green, or brownish flowers.

V. pinguifolium is known only from Barro Colorado Island. *V. dubium* and *V. viridiflorum* are occasional in thickets and forests.

3. ROULINIA Decaisne

Roulinia fluminensis Decaisne has been collected along the Trinidad River. It is a nearly glabrous vine with ovate-cordate long-acuminate leaves, and umbels of purplish white flowers.

4. FUNASTRUM Fourn.

Funastrum clausum (Jacq.) Schlechter, of occasional occurrence in thickets of the Pacific slope, is a nearly glabrous, chiefly herbaceous vine with linear to elliptic-oblong leaves which are pale beneath. The whitish flowers, 10 to 14 mm. broad, are arranged in long-stalked umbels. The pods are 5 to 6.5 cm. long and 1 cm. thick. In Costa Rica the plant is called "mata-tórsalo," the leaves being applied as a poultice to kill the larvae of the insect known as "tórsalo," which lays its eggs in the human body. In Mexico the vine is known as "petaquilla" and "bejuco de leche."

Specimens reported by Hemsley from Panama as *Philibertia cumanensis* Hemsl. (*Funastrum cumanense* Schlechter) are perhaps *F. clausum*, although they may really be *F. cumanense*, a species frequent in some parts of Central America.

5. MARSDENIA R. Br.

No material has been seen of *M. crassipes* Hemsl., described from Aspinwall (Colón). It is a glabrous vine with fleshy, ovate or obovate leaves 7 to 12.5 cm. long, and racemose flowers 6 to 7 mm. broad.

6. METASTELMA R. Br.

Metastelma pedunculare Decaisne, occasional on the Pacific slope, is a small, slender, chiefly herbaceous vine with lanceolate to oval leaves 1.5 to 3 cm. long and glabrous or nearly so. The minute corolla is densely villous within. In Salvador the plant is called "cuchamperrito," "cuchamper de zope," and "ojo de pescado."

7. BLEPHARODON Decaisne

Blepharodon mucronatum (Schlecht.) Decaisne, the only Central American species, is occasional on the Pacific slope. It is glabrous, essentially herbaceous vine with short-petioled, oblong to elliptic leaves 3 to 7 cm. long, and umbels of greenish flowers 1 cm. broad. In Panama the plant is called "chununa de caballo."

125. CONVOLVULACEAE. Morning-glory Family

Fruit indehiscent, sometimes baccate.
  Stigma globose-didymous; leaves not cordate. Ovary 2-celled..1. **MARIPA.**
  Stigmas 2, linear; leaves cordate.
    Sepals much enlarged in fruit; ovary 4-celled; fruit baccate....2. **RIVEA.**
    Sepals not or but little enlarged in fruit; ovary 2-celled; fruit woody. 3. **TURBINA.**
Fruit dehiscent by valves or by a lid, dry.
  Capsule dehiscent by a lid. Plants scandent............4. **OPERCULINA.**
  Capsule dehiscent by valves.
    Styles distinct nearly or quite to the base; plants not twining. 5. **EVOLVULUS.**
    Styles united up to the 1 or 2 stigmas; plants nearly always scandent.
      Stigmas linear or oblong.
        Outer sepals similar to the inner ones; leaves usually cordate at base. 6. **JACQUEMONTIA.**
        Outer sepals unlike the inner, much broader and usually cordate at base; leaves not cordate..........................7. **ANISEIA.**
      Stigmas globose.
        Stamens and style exserted; corolla usually salverform; flowers white or bright red.
          Corolla white; flowers open only at night....8. **CALONYCTION.**
          Corolla red; flowers open for all or part of the day..9. **QUAMOCLIT.**
        Stamens and style included; corolla funnelform or campanulate. 10. **IPOMOEA.**

The Convolvulaceae are mostly herbaceous but sometimes woody, and usually climbing. The leaves are alternate, without stipules, the often showy flowers perfect, axillary, and solitary or in cymes. The 5-lobed or parted calyx is usually persistent; the gamopetalous corolla has a 5-lobed or angled or entire limb and generally a long tube. The 5 stamens are inserted on the tube of the corolla, alternate with the lobes. The superior ovary is 2 to 6-celled.

1. **MARIPA** Aubl.

Corolla 12 to 15 mm. long..........................1. **M. densiflora** Benth.
Corolla about 35 mm. long.........................2. **M. panamensis** Hemsl.

The Maripas are large woody vines, the short-petioled leaves glabrous or nearly so, oblong to ovate or oval, and rounded or short-acuminate at apex. The flowers are borne in stalked many-flowered cymes, and the corolla is densely hairy outside.

M. densiflora grows on Taboga Island and is reported from Bohío. Its flowers are white. *M. panamensis* is endemic, occurring in forests of the Atlantic slope. The flowers are said to be pink or lilac outside and white within.

2. **RIVEA** Choisy

The only Central American species *R. campanulata* (L.) House, grows in thickets and forests. It is a large, herbaceous or woody vine, more or less puberulent, with broadly cordate, long-petioled, entire leaves. The pink funnelform corolla is 7 to 8 cm. long, the fruit 2 to 2.5 cm. broad and enclosed by the enlarged calyx. The sap of this plant is said to be employed in Panama for coagulating rubber (*Castilla*) sap. The local name is "batatilla."

3. TURBINA Raf.

Only one species, *T. corymbosa* (L.) Raf. is known from Central America, and it is occasional in thickets about the zone. It is a glabrous woody vine with cordate leaves and clusters of white flowers 2.5 to 3 cm. long. In Salvador this plant is called "campanilla"; in Tabasco "pascua" or "flor de pascua."

4. OPERCULINA Manso

Leaves entire; corolla pink or purple..........1. **O. alatipes** (Hook.) House.
Leaves lobed; corolla yellow.
  Leaves deeply 7-lobate, the lobes subequal......2. **O. tuberosa** (L.) Meisn.
  Leaves shallowly 3-lobate, the lateral lobes small.
    3. **O. alata** (Hamilt.) Urban.

The Operculinas are large herbaceous vines with showy flowers. *O. alatipes* has been collected on the Pacific slope. Its peduncles are narrowly winged. This species is known in Salvador as "campanilla" and "mechoacán"; in Mexico as "San Miguelillo."

O. tuberosa, known here as "Tivoli vine," is much planted for ornament about the zone, being the common yellow morning-glory. It is very showy because of the large, bright yellow flowers. In fruit the sepals are as much as 6 cm. long. The plant is often found wild in thickets. In Honduras it is called "mala hierba," its roots being reported as poisonous to pigs and horses but not to goats.

O. alata is a native species, very similar in its flowers to *O. tuberosa*. It is frequent in thickets of the Pacific slope.

5. EVOLVULUS L.

Plants creeping; leaves oval to orbicular, rounded or notched at apex. Flowers much shorter than the leaves....................1. **E. nummularius** L.
Plants erect or ascending; leaves linear to ovate, acute or mucronate.
  Peduncles 1-flowered, much shorter than the leaves...2. **E. sericeus** Swartz.
  Peduncles 1 or several-flowered, usually longer than the leaves.
    3. **E. alsinoides** L.

The plants are small inconspicuous herbs, more or less pubescent, with entire leaves and small, campanulate or rotate, blue or white corollas. All the species are occasional in grassland on the Pacific watershed. In *E. nummularius* the flowers are white; in the other two they are either white or pale blue. *E. alsinoides* is called "oreja de ratón" in Salvador; in Mexico "ojitos azules."

6. JACQUEMONTIA Choisy

Corolla hirsute outside; flowers in dense heads 2.5 to 5 cm. broad or larger, the bracts oval or orbicular, rounded or obtuse and mucronate at apex.
    Thyella 1. **J. perryana** Duchass. & Walp.
Corolla glabrous; flowers in cymes or umbels, or in small heads (usually 2 cm. or less in diameter).
  Inflorescence glandular-pilose................2. **J. azurea** (Desr.) Choisy.
  Inflorescence without glandular pubescence.
    Bracts, except the outermost, linear, hirsute, usually about as long as the corollas............Thyella....3. **J. tamnifolia** (L.) Griseb.
    Bracts broader than linear, puberulent or glabrate, much shorter than the corollas.
      Sepals acuminate, not ciliate............4. **J. pentantha** (Jacq.) Don.
      Sepals obtuse, conspicuously ciliate......5. **J. menispermoides** Choisy.

The plants are scandent and chiefly herbaceous, with entire cordate leaves. The blue or white flowers, borne in axillary heads or cymes, have a campanulate corolla.

J. perryana (*J. lactescens* Seem.) is a common vine of thickets. The flowers are showy, the corolla being milk-white and 3.5 cm. long. The local name is "batatilla macho." *J. azurea* is an annual herb with blue flowers, frequent on the Pacific slope. *J. tamnifolia*, frequent in the same region, has either blue or white flowers. *J. pentantha* is common in thickets, its blue or white flowers 1.5 to 2 cm. long, usually in dense heads subtended by ovate bracts. *J. menispermoides*, with blue flowers, has been found at Las Cruces.

7. **ANISEIA** Choisy

The only Central American species, *A. martinicensis* (Jacq.) Choisy, occasional in wet soil on the Atlantic slope, is a herbaceous vine, pubescent or glabrate, with oblong obtuse leaves and long-peduncled axillary white flowers. In eastern Salvador the plant is called "bejuco de pescado," the stems being used as lines for stringing fish.

8. **CALONYCTION** Choisy. MOONFLOWER

The common moonflower, *C. aculeatum* (L.) House (*Ipomoea bona-nox* L.), occasional in thickets, is a herbaceous vine, the stems often furnished with recurved prickles, the leaves cordate, entire or somewhat lobed, and glabrous. The axillary flowers are solitary or in small cymes, the corolla white, 6 to 10 cm. broad, with a very slender greenish tube 8 to 12 cm. long. The corolla opens rapidly about dusk and closes early in the morning. The vine is often grown for ornament in the United States. In Salvador the names used are "galán de noche," "pitoreta," "garza," and "bejuco de tabaco"; in Porto Rico "bejuco de vaca" and "bejuco de puerco." The milky sap is employed in Central America for coagulating rubber (*Castilla*) latex. In Salvador the stems are used for stringing tobacco leaves when these are hung to dry.

9. **QUAMOCLIT** Moench

Leaves pinnately parted into linear lobes..........1. **Q. pennata** (Desr.) Bojer.
Leaves cordate, entire or lobed..................2. **Q. coccinea** (L.) Moench.

One other species is known from Panama. The plants are herbaceous vines, easily recognized in this family by their handsome, bright red flowers, whose corollas have a long slender tube.

Q. pennata is occasional in thickets or as a weed in gardens, and is also planted for ornament. It is the well-known cypress vine, which is often seen in United States gardens. The flowers have a tube 2.5 to 4 cm. long. In Panama, as well as elsewhere in Central America the plant is called "cundeamor," while the West Indians know it as "cypress vine" and "four-o'clock." In Salvador the plant is called also "clavellina," and in Porto Rico "cambustera."

Q. coccinea is frequent in thickets. The flowers are 2 to 4 cm. long. In Mexico this species is called "trompillo"; in Porto Rico "cambustera."

10. **IPOMOEA** L. MORNING-GLORY

Sepals herbaceous, elongate, green, at least above.
  Leaves pedately parted into 5 leaflets; corolla white..........1. **I. aegyptia** L.
  Leaves entire or 3-lobed; corolla pink or blue.
    Corolla 7 to 9 cm. long; sepals ovate or lance-ovate..2. **I. cathartica** Poir.
    Corolla about 3 cm. long; sepals linear-lanceolate.
      3. **I. meyeri** (Spreng.) Don.

Sepals chiefly coriaceous, not green.

Leaves pedately parted, with usually 5 leaflets. Corolla white. **4. I. quinquefolia** L.

Leaves entire or lobed.

Corolla about 6 mm. long, yellow---**5. I. minutiflora** (Mart. & Gal.) House.

Corolla 2 cm. long or larger.

Flowers yellow, umbellate------------**6. I. polyanthes** Roem. & Schult.

Flowers pink, purple, blue, or white, not umbellate.

Stems not twining, erect in one species, in the others prostrate and usually rooting at the nodes; leaves often fleshy.

Plants erect, often suffrutescent. **7. I. crassicaulis** (Benth.) Robinson.

Plants prostrate, herbaceous.

Leaves hastate or variously lobed.

Leaves narrowly hastate--------------**8. I. reptans** (L.) Poir.

Leaves variously lobed, sometimes broadly hastate. **9. I. batatas** (L.) Lam.

Leaves entire.

Corolla about 3 cm. long; leaves oblong-cordate. **10. I. aquatica** Forsk.

Corolla usually 5 cm. long or larger; leaves not cordate, or sometimes rounded-cordate.

Leaves cordate at base, rounded to acute at apex. **11. I. asarifolia** (Desr.) Roem. & Schult.

Leaves truncate to obtuse at base, emarginate at apex.

Flowers white; leaves mostly oblong and 1 to 2 cm. wide----------------**12. I. stolonifera** (Cyrill.) Poir.

Flowers purple; leaves mostly suborbicular and 7 cm. wide or wider----------------**13. I. pes-caprae** (L.) Roth.

Stems twining.

Sepals rounded or very obtuse at apex, not awned.

Leaves deeply 5 or 7-lobate------------**14. I. digitata** (L.) Lam.

Leaves entire.

Corolla about 6.5 cm. long, the limb very narrow, black-purple. Seeds long-hairy------------------**15. I. nicoyana** House.

Corolla about 5 cm. long, the limb broad, pink, white, or bright purple.

Seeds bearing along the angles hairs longer than the diameter of the seed; sepals in flower about 6 mm. long. **16. I. syringaefolia** Meisn.

Seeds finely pubescent; sepals in flower about 10 mm. long. **17. I. morelii** Duchass. & Walp.

Sepals acuminate or awned.

Sepals pubescent or at least ciliate--------------**18. I. triloba** L.

Sepals glabrous.

Corolla about 3 cm. long; leaves usually lobed. **19. I. trifida** (H. B. K.) Don.

Corolla 4 cm. long or larger; leaves usually entire. **20. I. tiliacea** (Willd.) Choisy.

The genus is a large one in Central America, and other species are known from Panama. The English name for the plants is morning-glory. In Central America they are usually called "campanilla" (little bell), but on the Atlantic coast of Guatemala I was astonished to hear the name "gloria de la mañana," a literal translation of the English term. It has become current there, no doubt as a result of American influence, like some other modifications of English words, notably the curious word *suampo*, used on the Atlantic coast to indicate a swamp. Morning-glories are abundant in the lowlands of Central America, often providing wonderful displays of color. From Salvador northward into Mexico there are large tree species with showy white flowers.

I. aegyptia is an occasional weed, usually hirsute throughout. In Mexico it is called "trompillo." *I. cathartica* is a handsome plant, occasional in thickets, with pink or purple flowers. It is known here as "batatilla"; in Costa Rica as "churristate"; in Porto Rico as "bejuco de gloria." *I. meyeri* is a common weed with blue or purple flowers, called here "batatilla," and on Taboga "topetón." There are two forms of this species, with either glabrous or hirsute calyx. *I. quinquefolia* is a frequent weed with unattractive white flowers 1.5 to 2 cm. long. In Salvador and Porto Rico it is called "campanilla."

I. minutiflora is a curious plant, smallest of all the Central American species. It has been collected here only once, along the Río Tecumen. The leaves are broadly cordate and entire.

I. polyanthes, very common in thickets and one of the most abundant species of Central America, is easily recognized by its dense umbels of bright yellow flowers, 2 to 2.5 cm. long. In Panama it is called "batatilla amarilla"; in Salvador "cuelga-tabaco," "tripa de gallina," "cuajo de ule," and "jícama cimarrona"; in Porto Rico "aguinaldo amarillo." In Salvador the stems are used for stringing tobacco leaves that are hung to dry, and the juice is said to be employed for coagulating rubber sap.

I. crassicaulis (*I. fistulosa* Mart.) is planted for ornament and is also found wild, probably as an escape, in the savannas around Panama City. This morning-glory, which is bushy and 1 to 2 meters high, with handsome pink flowers 6 to 8 cm. long, is much grown for ornament in Central America. In Salvador it seems to be native, for it is abundant locally in wet soil about lakes. There it is called "campanilla," "campanola," and "chilco"; in Mexico "hiedra" and "barós." *I. reptans* is a species of swampy ground. It has been collected here only on the Río Agua Salud.

I. batatas, the sweetpotato or "camote," is grown commonly in Panama, as well as almost everywhere else in Central America, and often runs wild. The native home of this species is not known, but it is probably in the Pacific islands or Asia. The plants flower commonly in Central America, bearing white flowers 5 cm. long with crimson throat. *I. aquatica*, an Old World species, grown in Panama by the Chinese gardeners, resembles the sweetpotato plant, but has smaller flowers. The roots are useless, but the leaves and young shoots are cooked and eaten like spinach, and the plant is known here as "Chinese spinach."

I. asarifolia is frequent in wet savannas on the Pacific slope, and has been collected also on the Atlantic watershed. In general appearance it is much like *I. pes-caprae*, but it is not a strand plant. The flowers, about 5 cm. long, are either white or rose-purple. The Panama name is "batatilla." *I. stolonifera* is a strand plant of the Atlantic coast. *I. pes-caprae*, which occurs on both coasts, is widely distributed in the Tropics of both hemispheres, growing on sandy beaches just out of reach of the waves. The ropelike stems are frequently several meters long and form great mats with their succulent leaves. The flowers are 4 to 5 cm. long.

I. digitata is occasional on the Pacific slope, a large vine with purple flowers. *I. nicoyana* has been collected here only along the Tapia River. *I. syringaefolia* is frequent in thickets, a large vine with flowers 5 cm. long, often completely covering shrubs and small trees with a dense mantle of pale pink. The color of the flowers is particularly delicate, and this is one of the handsomest of all the morning-glories.

I. morelii, common in thickets, has pink, purple, or rarely white flowers about 5 cm. long. The local name is "batatilla." *I. triloba* is a very common weedy species with pink flowers and either lobed or entire leaves. In Panama and Salvador the plant is called "campanilla"; in Costa Rica "churristate." *I. trifida* has been collected on the Atlantic slope, and *I. tiliacea*, frequent on the Atlantic watershed, is a rather handsome vine with pink flowers. In Costa Rica the latter is known as "churristate"; in Salvador as "campanola" and "manto de Jesús."

126. POLEMONIACEAE. Phlox Family

The genus *Cobaea* is represented in the mountains of Panama.

1. LOESELIA L.

Loeselia ciliata L., of infrequent occurrence in brushy places on the Pacific slope, is a slender, essentially annual, pubescent or glabrate plant with opposite, petioled, ovate, sharply toothed leaves. On the upper part of the stem there are numerous cordate bracts whose teeth end in long bristles. The small cream-colored flowers have a 2-lipped corolla about 1 cm. long with 5 exserted stamens. The fruit is a 3-celled capsule. In Salvador the plant is called "lenteja" and "lentejilla."

One other species, *L. glandulosa* (Cav.) Don, with narrow bracts and purplish flowers, is known from Panama.

127. HYDROPHYLLACEAE. Waterleaf Family

1. NAMA L.

The only Central American species, *N. spinosa* (L). Kuntze (*Hydrolea spinosa* L.), is frequent in swampy places, especially on the Pacific slope, often growing in water. It is a viscid-hairy herb, probably perennial, the branched stems armed with numerous slender spines. The leaves are alternate, sessile or nearly so, lanceolate, and entire, the blue flowers solitary or cymose, with a 5-lobed calyx and campanulate, deeply 5-lobed corolla about 1 cm. broad. There are 5 stamens inserted at the base of the corolla tube. The fruit is a small 2-celled capsule. In Salvador the plant is called "abrojo" and "espina de bagre"; in Mexico "viuda," "cardo," and "espina prieta."

128. BORAGINACEAE. Borage Family

Style twice bifid; flowers in heads, spikes, or cymes; trees or erect shrubs. 1. CORDIA.
Style entire or once bifid; flowers in scorpioid secund spikes or racemes, these sometimes arranged in cymes; herbs or woody vines.
    Fruit drupaceous; woody vines........................2. TOURNEFORTIA.
    Fruit dry, separating into 2 or 4 nutlets..............3. HELIOTROPIUM.

In the high mountains of Chiriquí one species of *Lappula* occurs, and perhaps other genera are represented in Panama. The plants have alternate or rarely opposite, entire or toothed leaves, without stipules. The perfect regular flowers are small or large, with inferior, usually persistent calyx, the corolla gamopetalous, usually funnelform or salverform, with 5-lobed limb. The stamens are as many as the corolla lobes and inserted alternate with them on the corolla tube. The fruit is drupaceous or of 2 or 4 dry nutlets.

1. CORDIA L.

Calyx conspicuously 10-striate; leaves stellate-pubescent beneath. Flowers in panicled cymes.......... 1. **C. alliodora** (Ruiz & Pav.) Roem. & Schult.
Calyx not striate; pubescence not stellate.
  Flowers in cymes.
    Calyx in anthesis about 4 mm. long; leaves pale beneath with pubescence of minute appressed hairs.....................2. **C. bicolor** A. DC.
    Calyx in anthesis 2 mm. long; leaves not pale beneath, the pubescence sparse or of spreading hairs.
      Calyx tubular-campanulate; leaves thinly scaberulous beneath. 3. **C. sericicalyx** A. DC.
      Calyx campanulate; leaves densely velvety-tomentose beneath.
        Leaves mostly cordate at base, often obtuse.......4. **C. sulcata** DC.
        Leaves rounded or obtuse at base, acuminate. 5. **C. heterophylla** Roem. & Schult.
  Flowers in heads or spikes.
    Flowers spicate.
      Spikes interrupted, short-pedunculate; leaves broadly ovate, acuminate. 6. **C. ferruginea** (Lam.) Roem. & Schult.
      Spikes usually dense, long-pedunculate; leaves mostly oblong or lanceolate, sometimes ovate, mostly obtuse. 7. **C. curassavica** (Jacq.) Roem. & Schult.
    Flowers capitate.
      Flower heads 1 to 1.5 cm. in diameter, solitary; leaves obtuse or acute. 8. **C. globosa** (Jacq.) H. B. K.
      Flower heads less than 1 cm. in diameter, mostly paniculate; leaves acuminate..........................9. **C. corymbosa** (L.) Don.

Other species are known from Panama. The Cordias are trees or shrubs with alternate, toothed or entire, usually rough leaves. The flowers are small or large, white in our species, the corolla funnelform, salverform, or campanulate, with 4 to 6 short or elongate lobes. The fruit is a drupe.

C. alliodora (*C. gerascanthus* of Jacquin, not of Linnaeus) is a common tree here, and one of the most abundant trees of Central America. It attains a height of 15 to 20 meters, with a trunk 40 to 60 cm. in diameter. The leaves are mostly elliptic-oblong and entire. The fragrant white flowers have lobes nearly 1 cm. long. When in blossom, toward the end of the dry season, the tree is very showy, the flowers being borne in great profusion. The nodes of the young branches are nearly always enlarged by hollow swellings, which are inhabited by small but ferocious ants which bite painfully.

In Panama, as well as in most other parts of Central America, the tree is well known as "laurel." Other names given to it are "laurel blanco" (Salvador); "laurel macho" (Nicaragua); "canalete," "solera" (Colombia); "pardillo" (Venezuela); "bojón," "tambor," "hormiguero," "amapa prieta," "amapa bola," "palo de rosa" (Mexico); "capá prieta" (Cuba, Porto Rico); "árbol del ajo" (Peru).

The wood is rather light and soft, yellow to brown, coarse, tough, strong, and not very durable in the ground. It is highly esteemed in Central America for construction and furniture, and is sometimes employed for cooperage.

C. bicolor, growing in the Atlantic forests, is a tree of 10 meters with nearly sessile, oblong, abruptly acuminate leaves. *C. sericicalyx* (*C. panamensis* Riley) is a small tree of the same region. In *C. sulcata*, which has been collected at Monte Lirio, the leaves are often broadly oval and very large. *C. heterophylla*, common on the Pacific slope, is frequently only a shrub, but sometimes a tree of 10 meters. The large leaves are mostly oblong-ovate but sometimes ovate, and the yellowish white fruit (about 7 mm. in diameter) is sweet and edible. In Panama the tree is called "paico" and "nigüito."

C. ferruginea is a very common shrub in thickets. The inconspicuous flowers are about 3 mm. long. In Guatemala it is called "bejuco negro." *C. curassavica* (*C. chepensis* Pittier) also is a common plant, variable as to foliage characters. In Panama it is called "lengua de buey."

C. globosa is a shrub of the Pacific coastal thickets, but infrequent. The globose flower heads are rather showy. In Costa Rica this species is called "salvilla cimarrona"; in Salvador "zompopo" and "cuajatinta"; in Cuba "ateje"; in Porto Rico "copillo" and "saraguaso prieto." *C. corymbosa,* an unattractive shrub of the Pacific thickets, has small red fruit.

2. TOURNEFORTIA L.

Leaves densely hairy beneath. Corolla lobes broad, obtuse.
  Calyx lobes acute or obtuse; branches tomentose or short-hirsute.
    1. **T. hirsutissima L.**
  Calyx lobes long-acuminate; branches densely long-hirsute.
    2. **T. obscura A. DC.**
Leaves glabrous beneath or nearly so.
  Corolla about 15 mm. long, its lobes broad, rounded..3. **T. billergiana Beurl.**
  Corolla about 7 mm. long.
    Corolla lobes broad, obtuse; fruit not lobed........4. **T. bicolor Swartz.**
    Corolla lobes triangular, acuminate; fruit 4-lobed..5. **T. peruviana Poir.**

The Tournefortias are shrubs, usually scandent, with entire, mostly ovate-elliptic leaves, the small flowers whitish or yellowish green, arranged in one-sided, usually recurved spikes or racemes. The corolla is salverform, the fruit small (about 5 mm. or less in diameter) and berrylike, containing 4 small nutlets.

T. hirsutissima is occasional on the Atlantic slope. The flowers are less than 1 cm. long, the fruits (as in most species) white and transulcent. In Nicaragua the plant is said to be called "tiricia" and "frutilla"; in Mexico "perlas," "tlachichinoa", and "ortiguilla"; in Porto Rico "mata de nigua" or "bejuco de nigua"; in Colombia "lágrimas de San Pedro."

T. obscura, of occasional occurrence, is easily recognized by the long shaggy pubescence. *T. billbergiana* is common on the Atlantic slope. This species was described from Panama, but the original description is so brief that it is not certain that the name really relates to the plant here treated. *T. bicolor* is a common vine in woods and thickets, and *T. peruviana* is rather generally distributed.

3. HELIOTROPIUM L.

Spikes simple; flowers lavender........................1. **H. indicum L.**
Spikes forked; flowers white.......................2. **H. inundatum Swartz.**

Other species occur in Panama. They are weedy erect herbs with small salverform corollas.

H. indicum is one of the most common weeds of tropical America, but about the zone it is infrequent. It is a hirsute plant with large, ovate or oval leaves, the fruit consisting of two 2-celled nutlets. In Panama the plant is called "flor de alacrán"; in Costa Rica "lagartillo" and "cola de alacrán"; in Salvador "hierba de alacrán," "pico de zope," and "borraja de la tierra"; in Mexico "hierba del sapo" and "hierba de la mula."

H. inundatum is of infrequent occurrence here. Its pubescence is mostly appressed, the small leaves oval to oblong, the fruit of four 1-celled nutlets.

The garden heliotrope, *H. peruvianum* L., native of Peru, with handsome fragrant blue flowers, is sometimes grown for ornament.

129. VERBENACEAE. Verbena Family

- Leaves digitately compound. Trees---------- 1. **VITEX.**
- Leaves simple.
  - Leaves entire.
    - Flowers in panicles or large open cymes.
      - Leaves whitish beneath; flowers in panicled spikes----- 4. **AVICENNIA.**
      - Leaves green beneath; flowers cymose-paniculate.
        - Pubescence of simple hairs; calyx not inflated------- 2. **AEGIPHILA.**
        - Pubescence of stellate hairs; calyx inflated in fruit-- 3. **TECTONA.**
    - Flowers in racemes or headlike cymes.
      - Flowers in headlike cymes; leaves whitish beneath----- 4. **AVICENNIA.**
      - Flowers racemose.
        - Plants scandent; calyx deeply lobate, corolla-like, blue-purple; fruit dry---------- 5. **PETREA.**
        - Plants erect trees; calyx shallowly dentate, green; fruit drupaceous.
  - Leaves toothed---------- 6. **CITHAREXYLUM.**
    - Flowers in cymes or panicles.
      - Inflorescence terminal---------- 7. **CORNUTIA.**
      - Inflorescence axillary---------- 8. **CALLICARPA.**
    - Flowers in heads, spikes, or racemes.
      - Calyx inflated in fruit, covered with hooked hairs. Herbs-- 9. **PRIVA.**
      - Calyx not inflated, without hooked hairs.
        - Flowers in loose racemes; branches usually armed with stout spines. 10. **DURANTA.**
        - Flowers in dense spikes or heads; branches unarmed or with short prickles.
          - Stamens 2; flowers appressed to the rachis-- 11. **VALERIANOIDES.**
          - Stamens 4; flowers not appressed.
            - Fruit a juicy drupe; shrubs---------- 12. **LANTANA.**
            - Fruit dry; shrubs or herbs---------- 13. **LIPPIA.**

One or more species of *Verbena* occur in Panama. Some of the garden verbenas, of South American origin, doubtless are grown for ornament. Several species of *Clerodendron* also are to be found in cultivation. *C. thomsonae* Balf., a vine with clusters of flowers having white calyx and red corolla, is planted about the zone, and is known here as "bleedingheart."

The Verbenaceae are chiefly shrubs or trees, but sometimes herbs, with mostly opposite or whorled, rarely alternate leaves, and small or large, perfect, regular or irregular flowers. The calyx is inferior and 2 to 5-lobed or cleft, the corolla tube cylindric, its limb 4 or 5-lobed. The stamens are usually 4 and in pairs but occasionally 2 or 5, inserted on the corolla alternate with its lobes. The ovary is superior and 2 to 4-celled, the fruit drupaceous, or dry and separating at maturity into 2 to 4 nutlets.

1. VITEX L.

Vitex floridula Duchass. & Walp., of occasional occurrence on the Atlantic watershed, is a tree with whitish bark, the leaves 3-foliolate, with elliptic, acute or acuminate, entire leaflets, glabrate at maturity. The purple flowers, about 8 mm. long, are arranged in small, terminal or lateral cymes. The drupes are bluish black, about 1 cm. in diameter. The tree is known as "cuajado," and its wood is used for construction purposes. The wood is yellow with a green tinge, hard, and susceptible of a fine finish.

Another species, *V. masoniana* Pittier, also called "cuajado," grows in Darién. Some of the Mexican species of *Vitex* have edible fruit.

2. AEGIPHILA Jacq.

Aegiphila martinicensis Jacq., common in woods or thickets, is a shrub or small tree with short-petioled, mostly oblong-elliptic, acute or acuminate leaves. The small yellowish flowers are arranged in terminal panicled cymes, the showy orange drupes 8 to 10 mm. in diameter. In some parts of Panama the plant is called "Juan de la verdad." In Porto Rico it is known as "capaſllo."

Two or more additional species grow in Panama.

3. TECTONA L. TEAK

In Ancón there is growing a fine large tree of *T. grandis* L., the teak of commerce, native of India and Malaya. The leaves, which vary from ovate to broadly oval, are often 30 cm. long or larger, cuneate at base, and softly pubescent beneath. The small, white or bluish flowers are arranged in large terminal panicles. The ovoid fruit is enclosed in the enlarged green calyx. Teak wood is of great commercial importance, especially for shipbuilding. It is highly esteemed also for making fine furniture.

4. AVICENNIA L. BLACK-MANGROVE

Leaves pale above and minutely pubescent, mostly oblong; flowers in short dense cymose spikes ---------- **1. A. nitida** Jacq.

Leaves green and glabrous above, ovate to oval; flowers in interrupted panicled spikes ---------- **2. A. bicolor** Standl.

The Avicennias are small trees with thick petioled leaves, covered beneath with a dense white tomentum of minute white hairs. The white corollas are salverform, and the flowers inconspicuous. The fruit is a small oblique 2-valved capsule.

A. nitida is the black-mangrove, a common tree of mangrove swamps, sometimes reaching a height of 25 meters but usually much smaller. The leaves are 5 to 10 cm. long; the sericeous corolla about 1 cm. broad. The brown or nearly black, heavy, hard, and coarse wood is used locally for various purposes, but is of little importance. The bark is employed for tanning. The flowers are much visited by bees. The plant finds some use in domestic medicine, a gum obtained from the trunk being used in Salvador for throat affections. The seeds usually germinate before falling from the tree.

In Panama the tree is called "mangle" and "mangle salado"; in Costa Rica, "palo de sal," "culumate," and "mangle salsa"; in Salvador "árbol de sal," "istatén," and "ishtatén"; in Mexico, "mangle blanco" and "puyeque"; in Cuba, "mangle prieto"; in Porto Rico, "mangle bobo."

A. bicolor is a recently described species, known from the Pacific coast of Panama and from Salvador. It has been collected at Punta Paitilla, in mangrove swamps. In Salvador it is known as "mangle negro."

5. PETREA L. PURPLEWREATH

Calyx tube glabrous or scaberulous ---------- **1. P. volubilis** Jacq.

Calyx tube densely hirtellous ---------- **2. P. arborea** H. B. K.

No other species are known from Central America. The plants are large woody vines with nearly sessile, oblong to obovate, rough, obtuse or acute leaves, the handsome blue flowers arranged in long pendent racemes. The calyx lobes, which are the showy part of the flower, are oblong, 1.5 to 2 cm. long, the corolla funnelform and 1 cm. long. These vines are very beautiful when in flower, and are often planted for ornament. The tough stems are sometimes employed as a substitute for rope.

P. volubilis, of frequent occurrence in the forests of the Pacific slope, is known in Panama as "flor de mayo," "viuda," and "flor de la cruz," and the name "buirá" is reported. *P. arborea*, which has been collected in the Atlantic forests, is the common species of Central America and Mexico. In Costa Rica it is called "choreque"; in Salvador "adelfa," "flor de Jesús," and "lengua de vaca"; in Nicaragua "hoja chigüe"; in Mexico "totopostillo," "soltero," "bejuco de caballo," "jazmín," "raspa-sombrero," "flor de Santa María," and "coamecate azul"; in Colombia "jazmín azul" and "chaparrito."

6. CITHAREXYLUM L.

Citharexylum caudatum L., common in woods and thickets, is a shrub or small tree, glabrous or nearly so, with short-petioled, oblong to obtuse leaves 7 to 15 cm. long. The white flowers, about 5 mm. long, are arranged in slender terminal racemes 10 to 40 cm. long. The fleshy fruit, about 6 mm. in diameter, is reddish at first but black and shining when ripe. The long racemes of fruit make the tree rather showy. The tree is known in Panama as "manglillo," and the name "cigua" (sigua) is reported, perhaps incorrectly, since this name is usually given to trees of the laurel family. In Porto Rico the tree is called "higuerillo."

Another species, *C. macrochlamys* Pittier, has been described from the Río Fató, Province of Colón, where it is known as "iguanero."

7. CORNUTIA L.

Cornutia grandifolia (Schlecht. & Cham.) Schauer, frequent in thickets on the Pacific slope, is a shrub or small tree with 4-angled stems, the leaves ovate or broadly rhombic-ovate, 10 to 25 cm. long, acute or acuminate, sinuate-dentate or nearly entire, and densely soft-pubescent beneath. The purple flowers, with villous corolla about 1 cm. long, are arranged in large showy panicles. The fruit is a small globose drupe. The local names are "palo cuadrado" and "cuatro caras."

C. pyramidata L., with minutely puberulent corolla, has been collected in Panama.

8. CALLICARPA L.

Callicarpa acuminata H. B. K. has been collected on the Atlantic slope. It is a shrub or small tree with large, ovate to oblong-ovate, long-acuminate leaves, glabrate above and densely stellate-tomentose beneath. The whitish flowers, 3 mm. long, are disposed in short axillary cymes. The fruit is a black drupe 5 mm. in diameter. In Honduras the plant is called "vara de alcalde"; in Mexico "uvilla."

9. PRIVA Adans.

Priva lappulacea (L.) Pers. is a common weedy herb, the short pubescence partly of hooked hairs. The leaves are ovate and toothed, acute or acuminate, and the blue flowers, 3 to 4 mm. long, form long slender racemes. The fruit, enclosed in the green calyx, consists of 2 prickly nutlets. A form with white corollas is found occasionally. The calyces adhere tenaciously to clothing by their hooked hairs. The local name is "cadillo." In Salvador the plant is called "mozote," "mozote de gallina," and "mozote de pollo"; in Mexico "pegajosa."

10. DURANTA L.

Duranta repens L., common in thickets along the Pacific beaches, is a shrub or small tree with long, usually drooping or trailing, commonly spiny branches and small, obovate or ovate, obtuse or acute, toothed leaves. The lilac or white flowers, about 1 cm. long, form slender racemes. The ovoid fruit is 7 to 11 cm.

long, yellow at maturity. The shrub is often planted for ornament in Panama and elsewhere because of its showy flowers and fruit. About the zone it is known as "varita de San José," and the name "espina de paloma" is reported for Panama. In Chiriquí it is called "lora"; in Salvador "heliotropio" and "chulada"; in Nicaragua "pensamiento"; in Veracruz "espina blanca"; in Colombia "Adonis," "garbancillo," and "espino negro"; in Porto Rico "azota-caballo," "lila," "lluvia," and "cuento de oro."

11. **VALERIANOIDES** Medik.

Spikes stout, the rachis 4 to 5 mm. thick; furrows in which the flowers are embedded narrower than the rachis.........**1. V. jamaicense** (L.) Kuntze.
Spikes slender, the rachis 2 mm. thick; furrows as broad as the rachis.
2. V. cayennense (L. Rich.) Kuntze.

The name *Stachytarpheta* is often used for the genus. The plants are stout branched herbs, or sometimes suffrutescent, with ovate or elliptic, glabrate, crenate leaves. The blue or purple (rarely white) flowers have the calyx appressed to the spike and more or less sunken in long pits in the rachis. The fruit consists of two 1-seeded nutlets.

Both species are frequent weeds about the zone. *V. jamaicense* often grows on beaches. It is employed in tropical America in domestic medicine, and the leaves are said to have been used in Brazil for adulterating tea, and to have been exported to Europe as "Brazilian tea." *C. cayennense* is known in Panama as "verbena" and "cola de millo." By the West Indians of the zone these plants are called "porterweed." A tea prepared from the leaves is drunk, and it is said that this has the appearance of porter, and foams in the same manner.

12. **LANTANA** L. LANTANA

Stems usually prickly; corolla commonly yellow, turning red; leaves opposite; bracts at base of flower heads linear or linear-lanceolate....**1. L. camara L.**
Stems unarmed; corolla pink or purple; leaves mostly ternate; outer bracts ovate.
2. L. trifolia L.

The Lantanas are pubescent shrubs with 4-angled stems and ovate to lanceolate, toothed leaves. The flowers, in axillary long-stalked heads or spikes, although small are showy, because of their bright color.

L. camara is a common shrub of thickets. It is the lantana cultivated in the United States for its bright-colored flowers, which are much handsomer in the cultivated plants than in most of the wild forms. Widely distributed in tropical America, in some parts of the Old World, especially Hawaii, it has become thoroughly naturalized as a troublesome weed. The fruit is black, juicy, sweet, and edible, although not very palatable. The flowers vary greatly in color, but are usually orange-yellow when they first open, soon changing to deep red, so that each head has two colors of flowers. Occasionally one finds plants whose flowers are wholly of a deep rich red, and decidedly attractive. In Panama a decoction of the leaves is used as a remedy for colds and stomach affections, and other medicinal uses are made of the plant.

In its wide range many vernacular names are applied to the plant. In Panama it is called "pasarín," "hierba zorra," and "San Rafaelito," and by the West Indians "wild mint" and white sage." Other names in use in Central America are "cinco negritos," "cinco coloraditos," "corronchocho" (Guatemala), "santo negrito," "jaral" (Costa Rica), and "jarilla" (Costa Rica). In Mexico the lantana is called "hierba de Cristo," "tres colores," "uña de gato," "palabra de mujer," "siete colores," "confituria," "sonora," "confite," and "mora."

L. trifolia, of rather infrequent occurrence here, is a shrub of 1 to 2.5 meters with rather inconspicuous flowers. In Salvador it is known as "icaquito."

13. LIPPIA L.

Plants erect, woody------------------------**1. L. alba** (Mill.) N. E. Brown.
Plants prostrate or procumbent, herbaceous.
Peduncles much shorter than the flower spikes; spikes 4 or more at each node.
2. L. betulaefolia H. B. K.
Peduncles much longer than the spikes; spikes 1 or 2 at each node.
Leaves ovate, acute or acuminate-------------------**3. L. dulcis** Trev.
Leaves cuneate-obovate, obtuse or rounded at apex.
4. L. nodiflora (L.) Michx.

Other species are known from Panama. They have toothed leaves, and small flowers in very dense spikes.

L. alba (*L. geminata* H. B. K.) is sometimes seen here in gardens, but is not native, being imported probably from the West Indies or northern Central America. It is an aromatic pubescent shrub, a meter high or less, with ovate to oblong, mostly obtuse leaves, and small pink flowers. In Panama it is known as "mastranto" or "mastranzo"; in Costa Rica as "juanilama" or "juanislama"; in Guatemala as "orozuz"; in Mexico as "hierba buena," "té del país," and "mirto"; in Porto Rico as "poley"; in Cuba as "salvia." In Panama a tea made from the leaves is administered for stomach disorders and other affections.

L. betulaefolia, which grows in wet soil on the Atlantic side, is an herb with hollow stems, ovate-rhombic leaves, and minute greenish flowers. *L. dulcis* has been collected along the Chagres. It is an aromatic plant with small, greenish white flowers. It is common in many parts of Central America, being known as "orozuz," and employed as a remedy for coughs and colds. *L. nodiflora* is an inconspicuous creeping herb with small white flowers, frequent in wet soil on the Atlantic slope, and sometimes growing on beaches. In Salvador this species is called "lechuga de laguna."

130. MENTHACEAE. Mint Family

Calyx transversely crested on the upper side. Flowers racemose.
1. SCUTELLARIA.
Calyx not crested.
Stamens erect or ascending--------------------------------**2. SALVIA.**
Stamens declined.
Upper lip of calyx decurrent as wings upon the tube--------**3. OCIMUM.**
Upper lip of calyx not decurrent.
Lower lip of corolla flat or concave; cultivated plants------**4. COLEUS.**
Lower lip of corolla saccate; native plants.
Nutlets winged. Plants prostrate; flowers in heads.
5. MARSYPIANTHES.
Nutlets not winged--------------------------------**6. HYPTIS.**

The genus *Stachys* and probably other additional ones are represented in Panama. Our species are herbs or small shrubs, often aromatic, with 4-sided stems and opposite, simple, usually toothed leaves, without stipules. The flowers are perfect and irregular, the calyx inferior and persistent, 5-toothed, and commonly nerved. The gamopetalous corolla is usually 2-lipped. The fruit consists of four 1-seeded nutlets.

1. SCUTELLARIA L. Skullcap

Scutellaria purpurascens Swartz is of infrequent occurrence in forests of the Atlantic slope. It is a low puberulent perennial herb with long-petioled, ovate, usually cordate, sinuate-crenate leaves and short racemes of blue flowers nearly 1.5 cm. long.

2. SALVIA L. Sage

Flowers in very dense, headlike whorls, these subtended by broad green persistent reniform bracts........................1. **S. hyptoides** Mart. & Gal.
Flowers in loose whorls, the bracts mostly lanceolate and inconspicuous.
  Calyx in fruit about 2.5 mm. long, glandular-pubescent.
  2. **S. occidentalis** Swartz.
  Calyx 5 to 6 mm. long.
    Calyx glandular-pilose........................3. **S. micrantha** Vahl.
    Calyx glabrous or scaberulous, without gland-tipped hairs.
    4. **S. tiliaefolia** Vahl.

Several other Salvias are known from Panama. Our species are weedy herbs, annual or perennial, with small and inconspicuous, blue or white flowers.

S. hyptoides is of frequent occurrence in fields and brushy places. In Salvador this species is called "hierba de reuma," and is employed medicinally. *S. occidentalis* is one the most common weeds of tropical America, and grows nearly everywhere about the zone. The blue corolla is about 3 mm. long. The viscid calyces adhere to clothing and to the feathers and feet of chickens and other birds. The plant, which has a strong and disagreeable odor, is used in Panama as a remedy for toothache, and elsewhere it has various applications in domestic medicine. In Panama it is called "corrimiento" and "cansa-perro"; in Costa Rica "verbena"; in Salvador "mozote de gallina," "trencilla negra," "mozote de pollo," and "gonce de gallina."

S. micrantha (*S. orbicularis* Benth.) has been collected on the Atlantic slope, but not recently. *S. tiliaefolia*, which has been found in the same region, is an erect herb with white or bluish flowers.

3. OCIMUM L. Basil

Calyx in fruit about 10 mm. long........................1. **O. micranthum** Willd.
Calyx in fruit 5 to 7 mm. long.
  Stems pilose; fruiting calyx only slightly reflexed..........2. **O. sanctum** L.
  Stems glabrous or puberulent; fruiting calyx strongly reflexed.
  3. **O. basilicum** L.

The plants are erect aromatic herbs or small shrubs with petioled, entire or toothed, ovate to lanceolate leaves, and small whitish flowers whorled in elongate racemes.

O. micranthum is a common weed, an essentially annual herb. Its leaves are sometimes used for flavoring food, like those of the other species. It is also employed medicinally. In Panama the plant is called "albahaca." Elsewhere in Central America it bears the same name, and is known also as "albahaca de vaca," "albahaca de gallina," "albahaca montés," and "albahaca silvestre."

O. sanctum, an Old World species, naturalized in some parts of tropical America, has been collected in the savannas near Panama City. *O. basilicum* (pl. 61) is the Old World basil, cultivated in Panama for its leaves, which are used for flavoring food. This is a shrubby plant, a meter high or less, with mostly entire leaves. The local name is "albahaca fina." The West Indians call it "sweet basil."

4. COLEUS Lour. Coleus

The common garden coleus, *C. blumei* Benth., native of tropical Asia, is planted as an ornamental foliage plant. There are many varieties, differing in shape and color of the leaves. The small flowers are purplish. The local names are "pompolluda" and "chontadura," while the Barbadians call the plant "Jacob's-coat."

5. MARSYPIANTHES Mart.

The only Central American species, *M. chamaedrys* (Vahl) Kuntze (*M. hyptoides* Mart.), is occasional on the Pacific slope. It is a prostrate or procumbent herb, more or less viscid, with petioled ovate crenate leaves, and small purple flowers in axillary short-stalked heads. The plant is said to be known in Salvador as "zompopo."

6. HYPTIS Jacq.

Flowers pediceled or subsessile, whorled or in cymes, the cymes sometimes headlike but not globose.

Fruiting calyx 4 to 5 mm. broad---------------**1. H. suaveolens** (L.) Poit.

Fruiting calyx 2 mm. broad or smaller.

Calyx lobes triangular, herbaceous; leaves lanceolate, acute at base; flowers in axillary whorls------------------------------**2. H. verticillata** Jacq.

Calyx lobes subulate; leaves mostly ovate, rounded at base; flowers in dense cymes.

Bracts at base of cymes ovate or oblong--**3. H. mutabilis** (Rich.) Briq.

Bracts filiform----------------------------**4. H. pectinata** (L.) Poit.

Flowers sessile, in globose heads or in very dense terminal spikes.

Flowers spicate--------------------------**5. H. americana** (Aubl.) Urban.

Flowers capitate.

Calyces recurved; leaves mostly cordate or subcordate at base. **6. H. recurvata** Poit.

Calyces straight; leaves rounded to attenuate at base.

Fruiting heads 1.5 cm. or less in diameter.

Peduncles longer than the heads, borne only in the uppermost axils. **7. H. lantanifolia** Poit.

Peduncles shorter than the heads, present in the axils of the lower as well as upper leaves, the heads often sessile--**8. H. brevipes** Poit.

Fruiting heads 2 cm. in diameter or larger.

Leaves densely tomentose beneath, obtuse or rounded at base. **9. H. brachiata** Jacq.

Leaves glabrous beneath or nearly so, attenuate at base.

Calyx teeth shorter than the tube; peduncles mostly several times as long as the heads----------------------**10. H. capitata** Jacq.

Calyx teeth equaling or longer than the tube; peduncles twice as long as the heads or shorter---------**11. H. savannarum** Briq.

Other species are known from Panama. Except *H. verticillata*, our species are herbs, usually with toothed leaves, and small, mostly inconspicuous flowers. The calyx is tubular or campanulate, the corolla 2-lipped and white or purple.

H. suaveolens is a common weedy plant, copiously pubescent, with ovate, coarsely toothed leaves and purple corollas. In Panama it is called "salvia," "purga-perro," "hierba de San Juan," and "San Juanillo"; in Costa Rica "chian"; in Salvador "chichinguaste"; in Mexico "chan."

H. verticillata, also very common in thickets, is nearly glabrous, and is often woody, frequently 2 meters high. The very small corollas are white. This is well known to the West Indians by the name "John Charles," and a tea made from the leaves is used as a remedy for various ailments. Formerly the dried plant was sold in the zone commissaries. Among the Spanish people it is a favorite remedy for indigestion. In Salvador the plant is employed in fomentations to relieve rheumatism, insect stings, and itch. At Chepo the plant is called "paleca," and on Taboga the name "lechuguilla" was given, but this is probably an erroneous name. In Salvador and Honduras the plant is known as "verbena."

H. mutabilis is a common weed with lavender flowers. In Costa Rica it is called "chan"; in Salvador "chichinguaste," "chichinguaste blanco," "chan montés," and "orégano montés"; in Guatemala "mirto silvestre." *H. pectinata* is another weed, a branched herb, frequently 2 meters high, softly pubescent, sometimes forming dense thickets. The flowers are purple or rarely white. By the Barbadians the plant is called "payva," and a tea made of it is taken as a remedy for pains in the stomach.

H. americana grows in savannas on the Pacific slope. *H. recurvata* is frequent, at least on the Pacific watershed. *H. lantanifolia* is a low, very pubescent plant with mostly sessile leaves, frequent in grassland near the Pacific. At Chepo it is called "suspiro de monte." *A. brevipes* is a common herb of wet soil, with white flowers. *H. brachiata*, a stiff herb with broad thick leaves, is occasional in grassland on the Pacific side.

H. capitata is a common weed with small white flowers. On Taboga it is called "suspiro de monte," and the curious name "poisón" also was given for it there. The plant is employed medicinally in Panama. In Salvador it is called "chivóla." *H. savannarum* is a plant of the savannas.

131. SOLANACEAE. Potato Family

Fruit capsular. Plants herbaceous.
Stamens 4 ---------- 1. **BROWALLIA.**
Stamens 5.
Flowers panicled ---------- 2. **NICOTIANA.**
Flowers solitary in the axils ---------- 3. **PETUNIA.**
Fruit indehiscent, usually fleshy.
Calyx inflated, much enlarged in age and inclosing the fruit. Annual herbs. 4. **PHYSALIS.**
Calyx not inclosing the fruit.
Flowers 25 to 30 cm. long, pendent. Shrubs ---------- 5. **DATURA.**
Flowers much smaller, less than 6 cm. long.
Corolla tubular-funnelform. Shrubs or trees ---------- 6. **CESTRUM.**
Corolla rotate or broadly campanulate.
Anthers free, dehiscent by longitudinal slits. Calyx truncate. 7. **CAPSICUM.**
Anthers connivent.
Connective of the anther thickened dorsally. Unarmed shrubs or trees ---------- 8. **CYPHOMANDRA.**
Connective not thickened.
Anthers opening by longitudinal slits; plants herbaceous, unarmed, with pinnatifid leaves ---------- 9. **LYCOPERSICUM.**
Anthers opening by terminal pores; herbs, shrubs, or small trees, often prickly.
Calyx 5-lobed. Shrubs or herbs, often prickly. 10. **SOLANUM.**
Calyx truncate, often with 5 or 10 teeth inserted outside below the margin. Usually shrubs, unarmed; flowers axillary, solitary or fascicled ---------- 11. **LYCIANTHES.**

The Solanaceae are herbs, shrubs, or small trees, sometimes armed with prickles, the pubescence frequently of branched hairs. The leaves are usually alternate and simple or compound. The perfect flowers are small or large and showy, usually regular or nearly so, with gamopetalous corolla and commonly 5 stamens, these inserted on the corolla tube. The style is simple, with discoid or bilobate stigma, the ovary usually 2-celled. The fruit is a many-seeded berry or capsule.

1. BROWALLIA L.

Browallia americana L., frequent in moist thickets and fields, is a puberulent annual herb with petioled, chiefly ovate, entire leaves. The short-pediceled flowers are solitary in the leaf axils, the corollas blue or royal purple, about 2 cm. long, with slender tube and broad limb. The plant is sometimes grown for ornament in northern gardens, and it is rather pretty when in full flower. In Panama it is called "chavelita de monte"; in Salvador "no-me-olvides" and 'simpática."

The only other Central American species, *B. speciosa* Hook., with handsome blue flowers 6 cm. long, occurs in the mountains of Chiriquí.

2. NICOTIANA L. TOBACCO

Nicotiana tabacum L., the tobacco plant ("tabaco"), is grown occasionally in the region, but only upon a very small scale. It is cultivated extensively in many parts of Central America, Honduras being noted for the superior quality of its tobacco. The tobacco plant is a native of tropical America, although probably not known in a truly wild state.

3. PETUNIA Juss.

The common garden petunia, *P. violacea* Lindl., is planted for ornament. It is a native of western South America, a viscid herb with large salverform flowers in white or shades of pink and purple. In Central America the plant is usually known by the name "petunia."

4. PHYSALIS L. GROUNDCHERRY

Fruiting calyx about 1.5 cm. long. Plants glabrate. 1. **P. lagascae** Roem. & Schult.
Fruiting calyx 2 to 3 cm. long.
  Plants glabrate; leaves mostly acute or obtuse at base...... 2. **P. angulata** L.
  Plants copiously viscid-villous; leaves cordate or subcordate at base. 3. **P. pubescens** L.

Our species are low branched annuals with mostly ovate, sinuate-toothed or entire, petioled leaves. The small bell-shaped flowers are solitary in the axils, and commonly greenish yellow, with a dark brown or purple eye. The fruiting calyces are nearly closed, ovoid, and papery, pendent and suggesting a Chinese lantern. The fruit is a globose, green or yellowish berry. The fruits of some species are edible, and in the United States they are often used for making preserves, but little or no use is made of the fruits in Central America.

P. lagascae is occasional on the Pacific slope. In Salvador it is known as "huevos," and the names "topetón" and "hierba de sapo" are reported for Panama. *P. angulata* is a frequent weed on the Atlantic watershed. In Guatemala it is called "miltomate"; in Salvador "huevo de tortuga," "huevito," and "bomba." *P. pubescens* also is a common weed. It is said to be called in Panama "topetón" and "hierba de sapo."

5. DATURA L.

The angel-trumpet, *D. candida* (Pers.) Pasq., is planted here occasionally for ornament. It is a bushy shrub with large, nearly entire leaves, easily recognized by its huge pendent trumpet-shaped fragrant white flowers. This species is grown everywhere in Central America, and is found frequently in hedges and similar situations, always appearing as if introduced. It is especially abundant in the highlands of Costa Rica, where frequently there are long hedges of the plant, loaded with flowers, and affording a striking sight. In Costa Rica this

Datura is called "reina de la noche," but farther north the current name is "floripondio." In Guatemala the name "campona" is reported, and from Mexico "campanilla."

Another species of *Datura* (*D. stramonium* L.) with small flowers, the jimsonweed of the United States, grows in some parts of Central America.

6. CESTRUM L.

Leaves acute to long-attenuate at base............1. **C. macrophyllum** Vent.
Leaves rounded or very obtuse at base.
  Flowers 15 to 20 mm. long.
    Leaves glabrous beneath; flowers in lax axillary cymes.
      2. **C. panamense** Standl.
    Leaves thinly tomentulose or villosulous beneath; flowers in dense congested axillary cymes..............................3. **C. latifolium** Lam.
  Flowers 25 to 35 mm. long.
    Plants erect; corolla lobes 5 to 6 mm. long, obtuse...4. **C. nocturnum** L.
    Plants usually scandent; corolla lobes 8 mm. long, attenuate.
      5. **C. scandens** Vahl.

Other species are represented in Panama. The Cestrums are shrubs or small trees with petioled entire leaves. The calyx is campanulate or tubular and 5-toothed, the salverform or funnelform corolla white, yellowish, or green in our species, with long slender tube and 5 spreading lobes. The fruit is a juicy berry.

C. macrophyllum, frequent in forests of the Atlantic slope, is a shrub with large leaves, greenish white flowers in small dense axillary cymes, and white or purple berries. *C. panamense* is a slender tree, sometimes 9 meters high, with large, lanceolate or ovate-oblong leaves and pale green flowers. In Chiriquí it is called "hiede-hiede." It is frequent in forests about the zone. *C. latifolium* is common on the Pacific slope, a large shrub with purple fruit. The name "Juan de la Verdad" is reported for it.

C. nocturnum is occasional in thickets of the Pacific slope, a slender shrub with greenish white, fragrant flowers. In Salvador this species is called "palo hediondo;" in Guatemala "galán de noche" and "reina de la noche;" in Mexico "huele de noche" and "galán de tarde." *C. scandens* is a slender glabrous vine with greenish flowers, occasional in forests.

7. CAPSICUM L.

Corolla finely pubescent outside; inflorescence many-flowered.
  1. **C. macrophyllum** (H. B. K.) Standl.
Corolla glabrous; flowers usually solitary.
  Fruits large, usually 1.5 to 4 cm. in diameter or larger.......2. **C. annuum** L.
  Fruits small, less than 1 cm. in diameter.
    Fruit globose or nearly so..........................3. **C. baccatum** L.
    Fruit oblong, usually more than twice as long as broad..4. **C. frutescens** L.

C. macrophyllum (*Bassovia macrophylla* Coulter; *Solanum panamense* Van Heurck & Muell.) is frequent in moist thickets and forests. It is a large herb, a meter high, or rarely somewhat woody, with large, ovate, petioled, usually entire and nearly glabrous leaves. The numerous greenish white flowers, 6 to 8 mm. long, on long pedicels, are fascicled in the leaf axils. They are followed by globose berries, 1 cm. or less in diameter, which at first are yellow or orange but at maturity bright red. In Panama the plant is called "pintamora de monte"; in Guatemala "hoja de zope," "quilete," and "hierba de San Antonio."

The other three species, pepper or chile plants, are too well known to need description. They are natives of America, and it is probable that the names listed all represent forms of a single species.

C. annuum L. is the common redpepper, grown about the zone as well as in most other agricultural regions. It is found here also as an escape from cultivation. There are numerous varieties, varying in size, shape, and flavor of the fruit. The peppers ("chile," "ají") grown in Central America are of this species, although the fruits of the other two species, which are extremely hot, also are used for seasoning food. Mexico is noted for the profusion of chile used there in cookery, almost every dish being seasoned with it, but in Central America, except Guatemala, chile is little used. A sauce of hot peppers, chopped onions, marjoram, and other articles in vinegar is in common use for seasoning soups.

C. baccatum is usually a shrubby plant, often 2 meters high, frequent in brushy places about the zone. This is probably the primitive wild form of the American peppers. In Panama this species is known also as "ajillo"; in Salvador as "chilpepe," "chiltepe," and "chile de zope"; in Mexico as "chile chiltipín" or "chiltepín." *C. frutescens* also is a common shrubby plant, with fruits usually about 2 cm. long. In Salvador it is called "chile," "chiltepe," "chile largo," and "chile de zope."

8. **CYPHOMANDRA** Sendtn.

Cyphomandra heterophylla Donn. Smith has been found in the forests of the Atlantic slope, and is frequent in the lowlands of Costa Rica. It is a coarse shrub with ovate-cordate leaves, finely pubescent beneath, the leaves on young shoots often deeply lobed. The flowers are borne in cymes whose branches elongate greatly in age. The fruit, 2 to 3 cm. long, is at first green with lighter stripes, and at maturity yellow. In Costa Rica the species is called "tomate de árbol."

C. betacea Sendtn., the tree-tomato, is grown in Costa Rica and probably elsewhere in Central America for its edible fruits, which somewhat resemble tomatoes.

9. **LYCOPERSICUM** Mill. TOMATO

The tomato or "tomate," *L. esculentum* Mill., is grown in Panama, and the wild form, with fruits about as large as cherries, is a frequent weed. The tomato is probably a native of South America, but farther north it has been cultivated for many centuries. Wild plants are common in Central America, but they always behave as introduced plants. The wild form is often called "tomatillo." Tomatoes are said not to succeed in cultivation about the zone, and those seen in the markets are mostly small and inferior. In the zone commissaries it is remarkable to find the expensive Florida tomatoes offered for sale in winter. In other parts of Central America there seems to be no difficulty in growing tomatoes of excellent quality.

10. **SOLANUM** L.

Anthers elliptic or cylindric, obtuse, the pores usually anterior; plants unarmed.
  Fruit about 2 cm. long; leaves dimorphous, some of them entire, others lobed.
    1. **S. allophyllum** (Miers) Standl.
  Fruit 1 cm. long or less; leaves all entire.
    Pubescence of the leaves none or of simple hairs.
      Leaves pubescent beneath; plants herbaceous..........2. **S. nigrum** L.
      Leaves glabrous or nearly so; plants woody..3. **S. parcebarbatum** Bitter.
    Pubescence of the leaves of branched hairs.
      Flowers in lateral cymes or umbels; leaves obtuse or rounded at base.
        Flowers in few-flowered umbels; leaves densely stellate-pilose beneath; ovary glabrous........................4. **S. extensum** Bitter.

Flowers in many-flowered cymes; leaves minutely and very densely white-tomentose beneath; ovary stellate-pubescent.
5. **S. salviifolium** Lam.

Flowers in large terminal cymes; leaves acute to attenuate at base.

Leaves mostly oblong-oblanceolate and 2 to 2.5 cm. wide, shining above, the nerves impressed......................6. **S. asperum** Rich.

Leaves mostly elliptic or ovate and 6 to 18 cm. wide, dull above, the nerves not or scarcely impressed.

Pubescence of the branches of fine sessile stellate hairs.
7. **S. bicolor** Willd.

Pubescence of the branches of coarse stalked stellate hairs.
8. **S. umbellatum** Mill.

Anthers elongate, attenuate to the apex, the pores posterior or terminal; plants usually armed with prickles.

Branches densely pilose or hirsute with long simple hairs; fruit usually 3 to 5 cm. in diameter. Plants erect, chiefly herbaceous; leaves very prickly.

Ovary densely pubescent; fruit globose.......9. **S. hirsutissimum** Standl.

Ovary glabrous; fruit ovoid, mammillate...........10. **S. mammosum** L.

Branches sparsely or densely stellate-tomentose with short hairs; fruit usually less than 1.5 cm. in diameter. Plants woody.

Calyx truncate, with 5 minute distant teeth........11. **S. subinerme** Jacq.

Calyx deeply 5-lobate.

Leaves nearly sessile (petioles 7 mm. long or less).
12. **S. jamaicense** Mill.

Leaves petioled, the petioles usually over 1 cm. long.

Calyx and leaves armed with prickles; plants usually scandent.
13. **S. scabrum** Vahl.

Calyx and leaves usually unarmed; plants erect.

Ovary and fruit villous.............14. **S. erythrotrichum** Fernald.

Ovary and fruit glabrous.

Stems unarmed; leaves glabrate above......15. **S. hayesii** Fernald.

Stems prickly; leaves densely pubescent on the upper surface.
16. **S. diversifolium** Schlecht.

Numerous other species occur in Panama, and material of two other species has been collected about the zone, but it is too incomplete for identification. The plants are herbs, shrubs, or small trees, often armed with prickles, the pubescence in many species of stellate hairs. The leaves in our species are simple, and entire, angled, or lobed. Frequently the leaves are inserted on the branches in pairs, one of the leaves being much smaller than the other. The flowers are white, purple, or violet, with saucer-shaped corolla. The fruit is a small or large, usually globose berry.

S. tuberosum L., the potato ("papa"), native of the South American Andes, is cultivated in the mountains of Central America, especially in Costa Rica and Guatemala. The eggplant or "berenjena," *S. melongena* L., an Old World species, also is cultivated.

S. allophyllum (*Cyphomandra allophylla* Hemsl.; *Solanum ellipsoideibaccatum* Bitter) is frequent in moist thickets of the Pacific slope. It is a glabrous branched herb, sometimes a meter high, with small, greenish white flowers borne in few-flowered axillary racemes. The fruits are pendent, ellipsoid, compressed laterally, and striped with light and dark green. The local names are "hierba de gallinazo" and "hierba gallota."

S. nigrum, the black nightshade, is a common weed in Panama as well as in most other parts of the American tropics. It is a bushy herb with small, ovate, sinuate-toothed or entire leaves, and umbels of small, white or bluish flowers.

The black berries are 5 to 7 mm. in diameter. In the United States the berries are commonly reputed poisonous, but "improved" varieties of the species are often cultivated, under the names "wonderberry" and "garden huckleberry," for the fruits, which are used for making pies and preserves. In Central America the leaves and young shoots are much used as a pot herb, being cooked like spinach. Some use is made of the plant in domestic medicine. About the zone this species is called "pintamora," but the usual name for it in Mexico and Central America is "hierba mora."

S. parcebarbatum is occasional in the forests. It is a nearly glabrous shrub of 1 to 2 meters with chiefly elliptic, acute or acuminate, entire leaves, and umbels of small (4 to 6 mm. long) white flowers. It is sometimes called "sauco" and "hoja hedionda," and is said to be employed as a remedy for fevers and colds. *S. extensum* is a slender shrub, frequent in forests. All parts of the plant are densely soft-hairy, the leaves ovate, entire, acuminate, and nearly sessile. The small flowers are white. *S. salviifolium* is a slender shrub, occuring in swamps of the Atlantic coast. It is easily recognized by the ovate, nearly sessile leaves, green above and white beneath.

S. asperum, frequent in thickets, is a shrub of 2 to 3 meters with white flowers. The local name is "naranja china," and the Jamaicans call the plant "susumbers." *S. bicolor* is a frequent plant, a large shrub with long-stalked cymes of white flowers. In Mexico it is called "saca-manteca." *S. umbellatum* is a common shrub, widespread in Central America, and known in Salvador as "tapalayote"; in Nicaragua as "friega-plato"; in Guatemala as "lava-platos"; in Mexico as "berenjena."

S. hirsutissimum is an endemic species, occurring in forest along the Río Tapia. It is a very prickly plant with large white flowers and orange fruit. In *S. mammosum* (pl. 62), which is of frequent occurrence in fields on the Pacific slope, the flowers are purple, the fruit orange or yellow and showy. In Costa Rica this plant is called "pichichío"; in Nicaragua "chichita," "chichigua," "marimbita amarilla," and "chichona"; in Salvador "chichimora"; in Mexico and Porto Rico "berenjena"; in Guatemala "chicha"; in Colombia "rejalgar." The name "uña de gato" is reported from Panama. The fruit is reported poisonous, but in Salvador the seeds are employed as a remedy for colds. In Costa Rica a decoction of the leaves is administered as a remedy for diseases of the kidneys and bladder.

S. subinerme is one of the most common shrubs of the region, especially on the Pacific slope, frequently forming dense thickets. It is usually very prickly and 1 to 3 meters high, with ovate or elliptic, entire or shallowly lobed leaves, and large, bright purple flowers. The local names are "Santa Clara" and "araña-gato"; the Barbadians call the plant "susumba."

S. jamaicense, frequent in thickets, is a shrub, erect or more often scandent, with shallowly lobed, densely stellate-tomentose leaves, small whitish flowers in lateral racemes, and small orange-red fruit. In Panama the plant is known as "friega-plato" and "huevo de gato." *S. scabrum* is very common. It is usually a large vine, the stems armed with recurved prickles, the leaves varying from lanceolate and entire to deeply lobed. The flowers are white or dull purple. The local names are "friega-plato" and "araña-gato." In Costa Rica the species is called "tomatillo." *S. erythrotrichum* has been collected here only near the Tecumen River. It is a somewhat prickly shrub with large thin leaves, subcordate at base. *S. hayesii*, an endemic species growing on brushy slopes near the Atlantic coast, is a shrub or small tree, 3 to 6 meters high, with large broad entire leaves and white flowers.

S. diversifolium (*S. fendleri* Van Heurck & Muell.; *S. isthmicum* Bitter) is a common species, a prickly shrub of 1 to 3 meters, with large, densely tomentose, sinuate-lobate leaves and white flowers. The local name is "friega-plato," given in allusion to the fact that the flannel-like leaves are employed for cleaning greasy dishes. The Barbadians call the plant "sunsumba," and eat the young green fruits (as well as those of other species) with salt, as a relish with codfish, one of the food staples of the West Indian negroes. The shrub is known in Panama also as "huevo de gato," and in Mexico as "berenjena."

11. LYCIANTHES Hassler

Plants scandent; pubescence of minute stellate hairs.
1. **L. acidochondra** Bitter.
Plants erect; pubescence of simple hairs.
  Calyx not appendaged.................. 2. **L. heteroclita** (Sendtn.) Bitter.
  Calyx with 5 wartlike or subulate appendages below the margin.
3. **L. maxonii** Standl.

The species of this genus usually have been referred to *Solanum*, but they form a well-marked group that deserves generic segregation. They are erect or scandent shrubs or coarse herbs with alternate entire leaves, the flowers being axillary and either umbellate or solitary.

L. acidochondra is an endemic species of the Atlantic slope. *L. heteroclita*, a coarse herb or small shrub, grows in the same region. Typical *L. maxonii* is known only from Barro Colorado Island, but a form of it (var. *appendiculata* Standl.) has been collected along the Tapia River.

132. SCROPHULARIACEAE. Figwort Family

Corolla with lateral or anterior lobes external in bud; plants with harsh rough pubescence. Flowers racemose or spicate.
  Anthers 2-celled; flowers yellow............................ 1. **ALECTRA.**
  Anthers 1-celled; flowers white, blue, or pink.............. 2. **BUCHNERA.**
Corolla with posterior lobes external in bud; plants glabrous or with soft pubescence.
  Corolla red, tubular, the short lobes nearly equal. Flowers in cymes.
3. **RUSSELIA.**
  Corolla not red, often irregular.
    Corolla saccate on the lower side and with a hornlike process at base of anterior lobes. Flowers violet-blue, racemose....... 4. **ANGELONIA.**
    Corolla not saccate below, without a hornlike process at base of anterior lobes.
      Leaves alternate; stamens 5; corolla regular.............. 5. **CAPRARIA.**
      Leaves opposite or whorled; stamens 2 to 4; corolla more or less irregular.
        Stems quadrangular, the angles ridged or slightly winged; ridges to the anterior sinuses of the corolla often projecting as knoblike processes; septum of capsule persistent with the attached placentae.
          Sepals distinct or nearly so; fertile stamens 2; leaves sessile; angles of stem ridged.............................. 6. **ILYSANTHES.**
          Sepals united over one-third their length; fertile stamens 4; leaves petioled; angles of stem slightly winged.
            Flowers nearly sessile; sepals shorter than the capsule.
7. **VANDELLIA.**
            Flowers slender-pedicellate; sepals equaling or longer than the capsule.................................... 8. **TORENIA.**
        Stems terete or quadrangular, the angles not ridged or winged; ridges to the anterior sinuses of corolla, if developed, not projecting; septum of capsule rupturing, the placental mass finally free.
          Anther sacs separated; seeds striate................ 9. **STEMODIA.**

Anther sacs approximate; seeds reticulate.
  Corolla densely hirsute within..................10. **SCOPARIA.**
  Corolla not hirsute within.
    Perfect stamens 4..............................11. **BACOPA.**
    Perfect stamens 2 or 3.
      Flowers sessile or nearly so..............12. **GLOBIFERA.**
      Flowers slender-pedicellate........13. **HYDRANTHELIUM.**

A few other genera are represented in Panama. Our members of the family are herbs, or rarely suffrutescent, with usually opposite, simple leaves, without stipules. The flowers in the local species are mostly small and inconspicuous, but sometimes showy and brightly colored. The flowers are perfect, commonly irregular, the calyx inferior and persistent, with 5 or 4 sepals or lobes. The gamopetalous corolla has 5 or 4 lobes, the 4, 2, or 5 stamens attached to the corolla between the lobes. The fruit is a capsule.

1. **ALECTRA** Thunb.

The only Central American species, *Alectra melampyroides* (L. Rich.) Kuntze, which is not known to extend north of Panama, has been collected on brushy slopes near East Paraíso. It is a rough-hairy erect herb with lance-oblong, coarsely toothed, sessile leaves. The inconspicuous flowers are subtended by large leaflike bracts.

2. **BUCHNERA** L.

Stems hispidulous with stiff hairs having broad white bases; calyx scabrous on the nerves....................................1. **B. pusilla** H. B. K.
Stems pilose with slender soft hairs, these not having enlarged white bases; calyx scabrous between as well as upon the main nerves.
2. **B. lithospermifolia** H. B. K.

The Buchneras are slender erect rough-pubescent perennials with simple or branched stems and linear to oblong, serrate or entire, stiff leaves. The flowers are arranged in dense or interrupted spikes, with inconspicuous bracts. The small salverform corollas are white, pink, or pale purple. At least one other species occurs in Panama.

Both the species, which are much alike in general appearance, are of rather frequent occurrence in grassland on the Pacific slope.

3. **RUSSELIA** Jacq.

Stems all 4-angled...................................1. **R. sarmentosa** Jacq.
Stems, at least below, 6-angled..................2. **R. verticillata** H. B. K.

The Russelias are large erect herbs with conspicuously angled stems, the leaves sessile or nearly so, opposite or in 3's, usually broadly ovate and coarsely crenate or serrate. The tubular, bright red flowers, about 1 cm. long, are borne in small axillary cymes near the ends of the stems. The gaudily colored flowers make the plants conspicuous. *R. equisetiformis* Schlecht. & Cham., a Mexican species, with naked rushlike stems and long-pediceled flowers, is probably cultivated in Panama.

R. sarmentosa is of infrequent occurrence on the Pacific slope. In Nicaragua it is called "lluvia de coral." *R. verticillata* is rather frequent on brushy slopes. In Salvador the plant is called "lluvia montés" or "lluvia de coral montés"; in Mexico "arete." Although the stems of *R. verticillata* are usually all 6-sided, the upper branches are often 4-sided, and there is doubt in the writer's mind as to the distinctness of these two so-called species.

4. **ANGELONIA** Humb. & Bonpl.

Angelonia angustifolia Benth. is grown frequently in gardens as an ornamental plant. It is a native of Mexico, a nearly glabrous, erect herb with sessile linear-lanceolate serrate leaves and leafy racemes of long-pediceled violet flowers about 1.5 cm. long. In Nicaragua the plant is called "Porto Bello."

5. **CAPRARIA** L.

Capraria biflora L. is frequent in thickets along both coasts, often growing on beaches. It is a much-branched erect herb, sometimes 1.5 meters high, with chiefly lanceolate, sharply serrate leaves and copious pubescence. The small axillary white flowers, on slender pedicels, are inconspicuous. In Salvador the plant is known as "verbena" and "té silvestre"; in Mexico as "pericón" and "malva." In Panama it is called "cola de gallo" and "hierba té."

6. **ILYSANTHES** Raf.

The only Central American species, *I. inaequalis* (Walt.) Pennell, is frequent in wet soil on the Pacific slope. It is an inconspicuous glabrous annual, with weak stems 5 to 30 cm. long, small, sessile, entire or slightly toothed leaves, and very small, long-pediceled, white flowers.

7. **VANDELLIA** L.

The only Central American species is *V. diffusa* L., frequent in moist or wet places, often a weed in waste ground. The slender stems are frequently prostrate and rooting at the nodes, the short-petioled leaves rounded and shallowly crenate. The white flowers, 6 to 7 mm. long, are nearly sessile in the leaf axils. The plant grows also in the Old World, and may be introduced in America, although it is often found in localities where it has the appearance of a native species.

8. **TORENIA** L.

Corolla about 30 mm. long..............................1. **T. fournieri** Linden.
Corolla 3 to 4 mm. long..............2. **T. crustacea** (L.) Cham. & Schlecht.

The Torenias are glabrous annuals with ovate or rounded, crenate leaves and 5-toothed calyx.

T. fournieri is cultivated here for ornament, and in Mount Hope Cemetery has become naturalized. The large flowers are purple and black-purple and showy; the calyx has broad wings along the angles. The plant is probably of Asiatic origin.

T. crustacea (*Vandellia crustacea* Benth.) is a small and inconspicuous plant, usually 5 to 10 cm. high, with blue-purple flowers. It is a frequent weed in moist ground, introduced from the Old World tropics.

One other species, *T. thouarsii* (Cham. & Schlecht.) Kuntze, with small white flowers, occurs in the Changuinola Valley.

9. **STEMODIA** L.

Leaves sessile, lance-oblong; plants stout, usually 30 to 80 cm. high.
1. **S. durantifolia** (L.) Swartz.
Leaves petiolate, ovate to broadly rhombic-ovate; plants slender, usually 10 to 20 cm. high.
  Pedicels shorter than the calyx; corolla 4 mm. long, blue.
  2. **S. parviflora** Ait.

Pedicels longer than the calyx; corolla 8 mm. long, white.
  Calyx lobes equal or nearly so.................... 3 **S. angulata** Oerst.
  Calyx lobes unequal, the posterior longer than the others. 4. **S. pusilla** Benth.

The plants are pubescent herbs with small inconspicuous flowers and crenate or serrate leaves.

S. durantifolia is a frequent weed, a viscid-hairy perennial with small purple flowers. *S. parviflora* also is a common weed. In Costa Rica it is known as "hierba santa," and employed as a remedy for toothache. In Salvador it is called "corrimiento." *S. angulata* has been collected at Balboa, and *S. pusilla* was found by Fendler in the vicinity of Chagres.

10. SCOPARIA L.

Scoparia dulcis L. is one of the most common tropical American weeds, abundant about the zone. It is an erect much-branched herb, often a meter high, glabrous or nearly so, with small, ovate or lanceolate, toothed leaves, and small white flowers solitary or clustered on slender pedicels in the axils of the leaves. In Panama the plant is known as "escobilla amarga," and among the Barbadians as "sweet broom." The West Indians claim that the branches placed in drinking water keep it cool as if it were iced. In Salvador the plant is called "culantro" and "culantrillo."

11. BACOPA Aubl.

Pedicels not bracted. Leaves rounded at apex, entire.
  Leaves cuneate at base; outermost sepal ovate-oblong.
    1. **B. limosa** (Pennell) Standl.
  Leaves broadly rounded at base; outermost sepal cordate.
    Leaves about as broad as long............ 2. **B. violacea** (Pennell) Standl.
    Leaves conspicuously longer than broad... 3. **B. humilis** (Pennell) Standl.
Pedicels bearing 2 bracts at or near the apex.
  Leaves entire, cuneate at base, rounded at apex, fleshy.
    4. **B. monnieri** (L.) Wettst.
  Leaves serrate or crenate.
    Flowers sessile or nearly so.
      Stems villous; bracts rounded-ovate...... 5. **B. axillaris** (Benth.) Standl.
      Stems glabrous or with very short clavate hairs; bracts mostly elliptic.
        Flowers 3 to 3.5 mm. long; stems glabrous.
          6. **B. sessiliflora** (Benth.) Edwall.
        Flowers 1.5 to 2 mm. long; stems with short clavate hairs.
          7. **B. parviflora** (Pennell) Standl.
    Flowers long-pedicellate.
      Bracts cordate at base............. 8. **B. bracteolata** (Pennell) Standl.
      Bracts not cordate at base.
        Corolla pink or pale purple; upper leaves with broad clasping bases.
          9. **B. auriculata** (Robinson) Greenm.
        Corolla yellow; upper leaves acute at base.
          10. **B. procumbens** (Mill.) Greenm.

The Bacopas are small annual or perennial herbs, usually growing in wet soil. They are most plentiful in marshy places on the savannas beyond Panama City and nearly always several of the species grow together.

B. limosa has been collected here only once, in the savannas. *B. violacea* is of occasional occurrence in wet soil, and *B. humilis* is frequent on the Pacific slope, a weak herb with pale blue flowers. *B. monnieri* was collected by Fendler near Chagres, but has not been found here recently, although it is a common tropical plant. *B. axillaris* is frequent in wet places, a fleshy herb with white flowers.

B. sessiliflora also is a common species with minute white flowers. *B. parviflora* is common about the savannas, also *B. bracteolata* and *B. auriculata*. *B. procumbens* is a frequent weed.

B. parviflora and *B. bracteolata* are known only from Panama.

12. GLOBIFERA Gmel.

The only Central American species, *G. umbrosa* Gmel. (*Micranthemum orbiculatum* Michx.), is frequent on wet shaded soil. It is a very slender creeping herb, forming mats over the ground. The rounded entire leaves are 3 to 5 mm. long, the flowers so minute as to be seen only with difficulty.

13. HYDRANTHELIUM H. B. K.

Hydranthelium braunii Ernst has been collected near Fort Clayton. It is a weak herb with oblong entire leaves and slender-pediceled white flowers about 2 mm. long.

133. BIGNONIACEAE. Bignonia Family

Plants scandent; leaves, at least some of them, with tendrils. Fruit a capsule.
  Tendrils compressed at apex, terminating in sharp-pointed hooks. Flowers yellow .... 1. **MACFADYENA.**
  Tendrils not hooked at apex.
    Calyx apparently double, with 2 or 3 interior lobelike appendages. Flowers purple or pink; leaflets minutely lepidote beneath. 2. **AMPHILOPHIUM.**
    Calyx simple, not appendaged.
      Calyx spathaceous, deeply cleft on one side. Corolla pink. 3. **PHRYGANOCYDIA.**
      Calyx campanulate to tubular, not deeply cleft.
        Calyx very large, 4 cm. long or longer, inflated .. 4. **CALLICHLAMYS.**
        Calyx small, rarely 6 cm. long, not inflated.
          Disk none. Leaves glabrous; flowers pink; capsule linear; calyx minutely gland-dotted .... 5. **CYDISTA.**
          Disk present at base of pistil.
            Capsule densely spiny. Corolla pink .... 6. **CLYTOSTOMA.**
            Capsule not spiny.
              Fruit elliptic to orbicular. Flowers yellow or white. 7. **ANEMOPAEGMA.**
              Fruit linear or oblong.
                Calyx broadly campanulate, spreading. Buds tomentose at apex; flowers purple or pink .... 8. **PETASTOMA.**
                Calyx campanulate or narrowly campanulate, closely investing the base of the corolla.
                  Corolla glabrous outside except on the lobes; calyx teeth evident; flower buds acutish. Flowers pink. 9. **MANSOA.**
                  Corolla variously pubescent outside nearly to the base; calyx teeth minute or obsolete; buds usually rounded at apex.
                    Corolla somewhat saccate ventrally, very densely short-villous outside; valves of the capsule convex. Flowers pink or purple, in terminal panicles. 10. **PARAGONIA.**

Corolla not saccate ventrally, usually puberulent or finely tomentose; valves of the capsule flat.
  Capsule linear, the valves usually with a median ridge. Flowers pink or purple------11. **ARRABIDAEA.**
  Capsule usually oblong and not ridged. Flowers purple or white------------12. **ADENOCALYMNA.**
Plants erect; leaves never with tendrils.
  Leaves simple. Fruit baccate, gourdlike.
    Leaves fascicled, narrowly oblanceolate; seeds compressed, thin. 13. **CRESCENTIA.**
    Leaves alternate, solitary; seeds thick---------------14. **ENALLAGMA.**
  Leaves compound.
    Petioles winged. Fruit elongate, slender, terete, indehiscent; leaflets 3. 15. **PARMENTIERA.**
    Petioles not winged.
      Leaves pinnate or bipinnate.
        Leaves bipinnate-------------------------------16. **JACARANDA.**
        Leaves once pinnate.
          Fruit indehiscent; flower panicles pendent on long peduncles. 17. **KIGELIA.**
          Fruit dehiscent; inflorescence not pendent.
            Flowers yellow; leaflets serrate-----------------18. **TECOMA.**
            Flowers dark red; leaflets entire-------------19. **SPATHODEA.**
      Leaves digitately compound.
        Stamens pubescent; leaflets usually 7 or 9-------20. **GODMANIA.**
        Stamens glabrous; leaflets usually 5, sometimes 3--21. **TABEBUIA.**

A few other genera are represented in Panama. The Bignoniaceae are trees, shrubs, or woody vines, the leaves opposite or alternate, usually compound, the terminal leaflet often replaced by a tendril. The flowers are mostly large and showy, perfect and irregular, the calyx inferior, gamosepalous, and often closed in bud. The corolla is gamopetalous, usually funnelform, the 5 lobes more or less unequal. The 4 stamens are affixed to the corolla tube alternate with the lobes, and there is usually present a staminode, representing a sterile fifth stamen. The fruit is capsular or baccate, and usually large.

1. MACFADYENA A. DC.

The only Central American species, *M. uncinata* (Meyer) DC., occasional in woods and thickets, is a glabrous vine, the leaves with 2 elliptic to lanceolate, long-acuminate leaflets. The pale yellow flowers, 6 cm. long, are borne in small axillary clusters. The fruit is a linear capsule. The plant is easily recognized by the clawlike tendrils. The juvenile plants, with small obtuse leaflets, are often found creeping tightly along tree trunks.

2. AMPHILOPHIUM Kunth

Amphilophium paniculatum (L.) H. B. K., frequent in thickets on the Pacific slope, is usually a small vine, and often only an arching shrub. The leaflets are rounded-cordate, green above but pale beneath and covered with minute scales. The pink and whitish flowers, 3 to 4 cm. long, arranged in narrow terminal panicles, are not very handsome. The capsules are elliptic and compressed, 8 to 10 cm. long and 4 cm. wide, the seeds broadly winged. In Nicaragua the plant is said to be called "perico" and "pico de pato"; in Porto Rico "liana de cuello."

3. **PHRYGANOCYDIA** Mart.

The only species, *P. corymbosa* (Vent.) Bur., is common in thickets. It is a nearly glabrous vine, the leaves with 2 elliptic to oblong, usually acuminate leaflets. The bright pink flowers, 6 to 9 cm. long, borne in a terminal cyme, are very showy. The flat linear capsule is 20 to 30 cm. long. The spathelike calyx, about 3 cm. long, is a character by which the plant may be recognized.

4. **CALLICHLAMYS** Miquel

The genus consists of a single species, *C. latifolia* (A. Rich.) Schum., a large vine, of occasional occurrence in forests. The leaves have usually 3 large, nearly glabrous, elliptic leaflets. The bright yellow flowers, about 8 cm. long, are arranged in short racemes. The woody oblong capsules are about 15 cm. long and 6 cm. wide, the seeds large and broadly winged.

5. **CYDISTA** Miers

Cydista aequinoctialis (L.) Miers is a large, nearly glabrous vine, common in woods and thickets. The 2 leaflets are ovate or oblong, and often very lustrous, the pink, pale purple, or nearly white flowers 5 to 8 cm. long, in chiefly terminal racemes or panicles. The pods are linear, 25 to 40 cm. long, the valves usually with a dorsal ridge. The vine is a showy and handsome one. When the leaves are crushed they exhale an odor of garlic, hence some of the common names. In Salvador the plant is called "ajillo" and "coral"; in Mexico "cuero de vaca," "cebollín," and "cuamecate blanco."

6. **CLYTOSTOMA** Miers

The only Central American species is *C. isthmicum* Pittier, a nearly glabrous vine, which has been collected along the Chagres. The 2 leaflets are elliptic or oblong and cuspidate-acuminate, the purple-pink flowers 5 to 6 cm. long, in few-flowered, terminal or axillary clusters. The compressed woody fruit is oval, 6 cm. long, densely covered with stiff spines.

7. **ANEMOPAEGMA** Mart.

Leaves mostly with 3 (sometimes 5) leaflets; flowers 5 to 6 cm. long.
1. **A. orbiculatum** (Jacq.) DC.

Leaves with 2 leaflets; flowers 9 to 10 cm. long.
2. **A. punctulatum** Pitt. & Standl.

One other species occurs in Panama. The plants are large woody vines, glabrous or nearly so, with entire, oblong to broadly ovate leaflets, and large yellow flowers, clustered in the axils or in lateral racemes. The fruit is a large compressed capsule, nearly as broad as long.

A. orbiculatum is frequent in woods and thickets on the Pacific slope. On sterile plants most of the leaves are digitately 5-foliolate. The capsules are smooth and about 10 cm. in diameter. *A. punctulatum* grows on the Atlantic slope.

8. **PETASTOMA** Miers

Petastoma patelliferum (Schlecht.) Miers has been collected on the Pacific slope. It is a large vine, the 2 leaflets elliptic to ovate, acuminate, pubescent or glabrate. The purple flowers, about 4 cm. long, are arranged in large, terminal and axillary panicles. The linear capsules are 20 to 30 cm. long, the seeds with broad wings. In Salvador the plant is known as "bejuco de coral."

9. MANSOA DC.

The only Central American species, *M. difficilis* (Cham.) Bur. & Schum., has been collected in woods near Empire. It is a nearly glabrous vine, the 2 leaflets oblong-ovate, acute or acuminate, the showy flowers 6.5 to 7.5 cm. long, in axillary or terminal racemes. The linear capsules are about 20 cm. long.

10. PARAGONIA Bur.

The single species is *P. pyramidata* (Rich.) Bur., a large vine occurring on the Atlantic slope. The leaves have 2 oblong to elliptic, acutish leaflets, glabrous but minutely lepidote beneath. The pink flowers, 6 to 7.5 cm. long, form large dense terminal panicles. The linear pods are 35 to 40 cm. long. In Salvador the vine is called "bejuco de casa."

11. ARRABIDAEA DC.

Leaflets covered beneath with a dense minute whitish tomentum.
1. **A. pachycalyx** Sprague.
Leaflets glabrous beneath or sparsely pubescent, green.
  Corolla 1.2 cm. long------------------------2. **A. panamensis** Sprague.
  Corolla 3.5 to 5 cm. long.
    Leaflets 2, glabrous or nearly so, mostly oblong. 3. **A. isthmica** Standl.
    Leaflets 3 in most of the leaves, pubescent beneath, elliptic to suborbicular.
4. **A. rotundata** (DC.) Bur.

The plants are large vines, the leaves with 2 or 3 leaflets. The flowers are pink or purple, in large, terminal or axillary panicles, and very showy. The pods are long and linear.

A. pachycalyx is frequent in thickets on the Pacific slope, and during the dry season often affords a fine display of color. Among all the Panama vines of the family this may be recognized by the white under surface of the leaves. *A. panamensis* is known from a single collection by Hayes, from swamps near Panama City. *A. isthmica* also has been collected but once, near Paraíso. Its local name is "flor de pajarito." *A. rotundata* is rather common on the Pacific slope.

12. ADENOCALYMNA Mart.

Calyx densely and finely tomentose; leaflets with numerous large yellowish glands beneath------------------------------------1. **A. flos-ardeae** Pittier.
Calyx thinly and very minutely puberulent; leaflets not glandular beneath.
2. **A. foveolatum** (DC.) Bur.

One other species is known from Panama. The plants are large woody vines, the leaves with 2 or 3 large, oblong to ovate leaflets. The showy flowers, 6 to 7 cm. long, are in small, axillary or terminal racemes.

A. flos-ardeae was described from the Río Fató, Province of Colón, and sterile specimens from the zone are probably conspecific. The corolla is said to be white. *A. foveolatum*, which has been collected on the Atlantic slope, has pale purple flowers.

13. CRESCENTIA L. CALABASH.

Crescentia cujete L. is frequent on the Pacific slope, a small tree with low crown and long, sometimes drooping branches. The leaves are persistent, clustered, oblanceolate to spatulate, acute to rounded at apex, entire, and glabrous or nearly so. The pediceled flowers are solitary or clustered on the trunk and branches, 5 to 8 cm. long, dark brownish purple, with an irregularly cleft calyx. The fruit is highly variable as to size and shape, sometimes oval and then comparatively small, but in some forms subglobose and 30 cm. in diameter. It has a thin shell which resembles a gourd, and within copious pulp, full of large thin seeds.

The pulp is much used in domestic medicine, especially as a remedy for colds. The dry fruits are of great importance locally, especially for use as cups and kitchen utensils. Cups made from the shells are often highly ornamented by carving and painting. The chocolate cups or *jícaras* of the Mexicans and Central Americans were made from these fruits.

The tree is a favorite host for orchids. In some places on the Pacific coast of Central America there are extensive pure stands of the trees, forming a distinct and characteristic plant association. The trees that bear the very large fruits are of curious appearance, for it seems impossible that the branches should support such huge fruits, which suggest green pumpkins. As a matter of fact, the fruits are not very heavy.

The wood is light or yellowish brown, with veins of darker color, moderately hard and heavy, tough and strong, coarse, and fairly easy to work. It is employed for tool handles, ox yokes, saddles, and for various small articles. Seemann reports that in Panama the fruit was used for dyeing cloth black.

In Panama the tree is called "totumo," "totumbo," "calabazo," and "palo de calabaza." Other names employed are "jícaro, "jícara" (Central America generally); "guacal," "jícaro de cuchara," "huacal," "cutuco" (Salvador); "morro" (Guatemala); "totuma," "güira" (Cuba); "calabacero" (Costa Rica); "cujete," "cirián," "tecomate," "guaje" (Mexico); "taparo" (Venezuela).

One other species is known from the mountains of Panama.

14. **ENALLAGMA** Baill. BLACK CALABASH

The only Central American species, *E. cucurbitina* (L.) Baill., is frequent here in tidal swamps and in coastal thickets. It is a large shrub or small tree with thick, obovate, very lustrous leaves often 20 cm. long, rounded and short-acuminate at apex, and nearly sessile. The flowers are about 5 cm. long and greenish, the fruit large (8 to 10 cm. in diameter) and globose, resembling a gourd. The local names are "tutumito" and "tutumillo."

15. **PARMENTIERA** DC. CANDLETREE

Parmentiera cereifera Seem. (pl. 63), of frequent occurrence in the Atlantic forests, is a good-sized tree, often branched to the base, the leaves with 3 small, obovate, acute, entire or toothed, thin, glabrous leaflets. The flowers are borne on the larger branches and are 6 to 7 cm. long, with large brownish calyx and white corolla. The pendent fruits are cylindric, 30 to 120 cm. long and 2 to 2.5 cm. thick, fleshy, smooth, and yellowish, strongly suggesting wax candles. When loaded with fruit the tree is of striking appearance. The fruit has an apple-like odor. It is said to afford an excellent feed for cattle. The local name is "palo de velas."

16. **JACARANDA** Juss.

Leaflets cuneate at base, usually acuminate; corolla densely and finely tomentose outside; flowers in large terminal panicles______1. **J. copaia** (Aubl.) Don.
Leaflets obtuse or rounded at base and apex, mucronate; corolla glabrous outside; flowers in small lateral panicles________________2. **J. filicifolia** Don.

The Jacarandas are handsome large trees with ample, opposite, abruptly bipinnate leaves composed of numerous small, entire or toothed leaflets. The large flowers (3 to 4 cm. long) are blue, violet, or purple, in showy panicles. The pods are oval or rounded and compressed, containing broadly winged seeds. When in flower the trees are very showy.

J. copaia is of frequent occurrence in the Pacific forests, and *J. filicifolia* has been reported from the same area. The wood of *J. copaia* is described as oatmeal-colored or dingy white, light and soft but firm, with straight medium grain. In South America it is employed for light interior construction, boxes, etc. In Panama these trees are called sometimes "palo de buba," and the bark is employed as a remedy for skin diseases.

17. **KIGELIA** DC. SAUSAGETREE

Kigelia africana (Lam.) Benth. (*K. pinnata* DC.), a native of west tropical Africa, is planted in Balboa. It is a good-sized tree with large odd-pinnate leaves, having ovate or elliptic, nearly entire, glabrous leaflets. The brownish red, bell-shaped flowers, 6 to 8 cm. long, are arranged in large hanging panicles. The large fruits are pendent from the branches on long slender ropelike stems, and in their form and size are strongly suggestive of sausages. The tree is known also as "fetish-tree," being considered sacred by the natives in some parts of Africa.

18. **TECOMA** Juss. TRUMPETBUSH

The only Central American species, *T. stans* (L.) Juss., is of frequent occurrence in thickets on the Pacific slope, and here as elsewhere is often planted for ornament. It is a common and widely distributed species of tropical America, a slender shrub or small tree with opposite odd-pinnate leaves, the 5 to 13 leaflets usually serrate and (in Central American forms) nearly glabrous. The handsome and showy flowers, 3.5 to 5 cm. long, are borne in terminal racemes or panicles. The linear pods are compressed, 10 to 20 cm. long and 6 mm. broad.

The English name "yellow-elder" is sometimes used.

The generic name is derived from an Aztec word meaning trumpet. The name "copete" is reported from Panama, and other names in use are the following: "Candelillo," "carboncillo," "vainilla" (Costa Rica); "chilca," "sardinillo" (Nicaragua); "tache," "tasto," "tagualaiste," "San Andrés," "marchucha" (Salvador); "tronador," "gloria," "San Pedro" (Mexico); "sauco amarillo," "roble amarillo" (Porto Rico).

Some use is made of the plant in domestic medicine. The shrubs are too small to furnish wood of value, although it is reported that in northern Mexico it was employed by the Indians for making bows.

19. **SPATHODEA** Beauv.

Spathodea campanulata Beauv., of tropical Africa, is planted in various places about the zone, and is known here as "tuliptree." It is a tall tree with narrow crown, the large pinnate leaves having about 9 elliptic, entire, nearly glabrous leaflets. The flowers are borne in short terminal racemes. The tomentose calyx is spathelike, split nearly to the base on one side. The dark red corollas are 10 cm. long or larger, and very irregular. The tree is one of the most showy of all those in cultivation here.

20. **GODMANIA** Hemsl.

The only North American species is *G. aesculifolia* (H. B. K.) Standl., a small tree frequent in woods or thickets. The leaves are opposite and long-stalked, with 5 to 9 obovate to oblong-oblanceolate leaflets, pubescent or glabrate beneath, entire on adult plants but coarsely toothed on seedlings. The greenish yellow flowers, 1 cm. long, are arranged in small dense terminal panicles. The fruit is a slender capsule, sometimes 90 cm. long, containing numerous winged seeds. In Costa Rica the tree is called "corteza de chivo"; in Salvador "cortez blanco"; in Mexico "roble" and "cacho de toro."

21. TABEBUIA Gómez

Calyx and leaves stellate-tomentose; corolla yellow.
1. T. guayacan (Seem.) Hemsl.

Calyx and leaves minutely lepidote; corolla pink or white.
  Corolla pink; leaflets 5, elliptic or ovate, rounded or very obtuse at base.
2. T. pentaphylla (L.) Hemsl.
  Corolla white; leaflets 1 to 3, attenuate at base........**3. T. palustris** Hemsl.

The Tabebuias are usually trees, with opposite, long-petioled, digitately compound leaves. The leaflets are usually entire on adult trees, but on young plants they are often toothed. The large showy flowers are borne in terminal cymes, panicles, or heads. The pods are pendent, long and cylindric, containing numerous broadly winged seeds.

T. guayacan, a species known to extend from Panama to Guatemala, was described from Panama (Las Cruces), and is of frequent occurrence in forests about the zone. It attains a height of 30 meters and a trunk diameter of over a meter, being sometimes buttressed at base. The leaves have 5 large leaflets, densely tomentose beneath on adult trees, but on seedlings almost glabrous. The bark is pale gray and nearly smooth. The handsome flowers are 8 cm. long. In Panama and Guatemala the tree is called "guayacán," and the names "cortez" and "corteza" also are used in Guatemala.

The wood is described as olive-brown or reddish brown, very dense and hard, fine or medium-grained, very durable, and taking a high polish. It is considered one of the best of Panama woods, and is used for many purposes, such as tool handles and boats. Some of the beams of the cathedral of Old Panama are said to have been of this wood, and to have remained sound although exposed to the weather for 250 years.

T. pentaphylla, of frequent occurrence here, is abundant in many parts of Central America, especially along the Pacific slope. The tree is of large or medium size. To the naked eye the leaves appear glabrous, but examined under a lens they are found to be covered with minute scales. The flowers are 7 to 10 cm. long, the pods 20 to 35 cm. long or larger, and over 1 cm. thick. This is one of the most beautiful of Central American trees, when, during the end of the dry season, it is densely covered with the flower panicles, so as to form a giant bouquet. The trees, especially if growing in dense stands, afford an unsurpassed display of color, varying from nearly white to deep rose. In their tints the flowers recall Japanese cherries, and are equally beautiful.

In Panama the tree is called "roble" (or "roble de sabana"), a name used elsewhere in Central America and in Mexico. Other current names are "guayacán" (Costa Rica); "maculigua," "maculez," "maquiligua," "maculís," "macuilís" (Salvador); "matilishuate," "mano de león" (Guatemala); "ocobo" (Colombia); "cortez" (Honduras); "apamate," "roble colorado" (Venezuela); "roble blanco" (Porto Rico); "macuil," "maculiz prieto," "María blanca," "palo de rosa," "palo yugo," "rosa morada," "amapa rosa" (Mexico).

The wood is dull grayish brown, finely striped with deep brown, moderately light and soft to rather hard and heavy, of medium texture, and easy to work. It is highly esteemed in Central America, being employed for a wide variety of purposes—general construction, boats, piers, carts, and furniture.

T. palustris, a little-known species, was described from specimens collected by Hayes in "swamps of the Río Grande," but it has not been here found recently. It is said to be a shrub of 1 to 3 meters with white flowers 5 cm. long, about 6 in a cluster and nearly sessile. The pods are described as oblong and only 7.5 cm. long.

134. PEDALIACEAE. Sesame Family

1. SESAMUM L. Sesame

Sesamum orientale L., the sesame, native of the Old World tropics, is planted occasionally in Panama, as well as elsewhere in Central America. It is an erect annual, hairy throughout, simple or branched, with oblong to lanceolate, opposite and alternate leaves, the lowest often lobed and parted. The white or pinkish flowers, 2 cm. long, are short-pediceled in the leaf axils. The corolla is 2-lipped, with a broad tube, and there are 4 stamens. The 2-celled capsule is 2 cm. long or larger, oblong and pointed, containing numerous black or white seeds.

In Panama and elsewhere the plant is called "ajonjolí" or "ajonjolín." The seeds are much used in Central America for flavoring candy. In India an oil, called sesame, bene, benne, or teel oil, is expressed from the seeds. It is odorless and does not easily become rancid, hence is used in India for cooking. In Europe the oil is employed in soap manufacture and for the adulteration of olive oil.

135. GESNERIACEAE. Gesneria Family

Ovary partly inferior. Plants herbaceous.
  Corolla red; disk present in the flower ---------- 1. **KOHLERIA**.
  Corolla purple or white; disk none.
    Corolla tube ventricose or campanulate ---------- 2. **GLOXINIA**.
    Corolla tube slender-cylindric ---------- 3. **ACHIMENES**.
Ovary wholly superior.
  Corolla about 5 mm. long, nearly rotate. Small weak herb with few crenate leaves; calyx green ---------- 4. **NAPEANTHUS**.
  Corolla 15 mm. long or larger, with a narrow tube.
    Anther cells confluent at apex, divergent. Large erect herb; leaves serrulate; corolla orange; calyx green ---------- 6. **BESLERIA**.
    Anther cells distinct, usually parallel.
      Anther cells divergent. Filaments free; small epiphytic shrub with thick fleshy entire leaves; corolla white; calyx green -- 5. **CODONANTHE**.
      Anther cells parallel.
        Plants herbaceous, terrestrial; corolla yellow. Filaments free; calyx green; leaves thin, crenate ---------- 7. **TUSSACIA**.
        Plants shrubby, often epiphytic; corolla red.
          Filaments connate at base; calyx red or tinged with red. 8. **COLUMNEA**.
          Filaments free; calyx green ---------- 9. **DRYMONIA**.

A few other genera probably are represented in Panama. The plants are herbs or small shrubs, the leaves opposite, simple, and entire or toothed. The perfect flowers are often large and showy and usually irregular. The calyx is inferior or united with the ovary, the corolla gamopetalous, sometimes 2-lipped, with commonly 5 lobes. The 4 or 2 stamens are inserted on the corolla tube. The fruit is a 1-celled capsule, often somewhat fleshy, containing numerous small seeds.

1. KOHLERIA Regel

Kohleria tubiflora (Cav.) Hanst. is of frequent occurrence in brushy places and on shaded banks. It is a coarse, copiously villous perennial with petioled, ovate to oblong, acute or acuminate, crenate leaves, which are often red or purple beneath. The flowers are pediceled in the upper axils. The tubular corolla, 2.5 cm. long, is densely villous and bright red. The plants are showy because of their brightly colored flowers. Seemann reports the vernacular name as "guatatuco."

2. GLOXINIA L'Hér.

Calyx lobes obovate or elliptic..................1. **G. perennis** (L.) Fritsch.
Calyx lobes linear..................................2. **G. pallidiflora** Hook.

The Gloxinias are large herbs, thinly villous or glabrate, with broadly ovate, crenate leaves. The large (about 3 cm. long), pale purple flowers are axillary and in terminal bracted racemes.

G. perennis, a South American species, is sometimes planted for ornament. *G. pallidiflora,* which may not be distinct from *G. perennis,* is reported from Paraíso by Hemsley.

3. ACHIMENES R. Br.

Achimenes panamensis (Seem.) Hemsl. is occasional on wet shaded banks on the Atlantic slope. It is a villous perennial, 10 to 20 cm. high, with oblong to ovate, obtuse or acute leaves. The white flowers, 4 cm. long, are pediceled in the leaf axils.

4. NAPEANTHUS Gardn.

Napeanthus repens Donn. Smith has been found on shaded wet banks near Gatún. It is an inconspicuous herb, the stems 1 to 5 cm. long, bearing a few thin, crenate, sparsely villous leaves. The white flowers are axillary or in short racemes, on long slender pedicels.

5. CODONANTHE Hanst.

Codonanthe calcarata Hanst. is frequent on the Atlantic slope, a small epiphytic shrub, pendent or scandent, with glabrous foliage. The fleshy leaves are elliptic or obovate, 2.5 to 5 cm. long, acute or obtuse. The corolla is 3 cm. long, white, often tinged with purple.

6. BESLERIA L.

Besleria laxiflora Benth. is infrequent in forests of the Atlantic slope, a slender herb or shrub a meter high. The long-petioled leaves are nearly entire, elliptic, green and glabrous above, pale beneath and sparsely appressed-pubescent. The orange flowers are about 2 cm. long, in axillary stalked umbels.

7. TUSSACIA Reichenb.

Tussacia friedrichsthaliana Hanst. is of occasional occurrence in the forests of the Atlantic slope. It is a low herb with oblong to ovate, crenate leaves on winged petioles, and with large, yellow or orange flowers. It is probably this species which was reported from Mamei by Hemsley as *T. pulchella* (Donn) Reichenb.

8. COLUMNEA L.

Leaves 2 to 4 cm. long, sparsely appressed-pilose......1. **C. billbergiana** Beurl.
Leaves 25 to 40 cm. long or larger, villous-hirsute....2. **C. purpurata** Hanst.

C. billbergiana is an endemic species of the Atlantic slope, a small epiphytic shrub with lanceolate or oblong leaves. The bright red, axillary flowers are 4 to 5 cm. long. *C. purpurata,* which has been collected on Barro Colorado Island, is a shrub a meter high or larger, with large oblique oblong leaves, very hairy throughout. The dense axillary inflorescences are bright red, and have a covering of long soft red hairs.

9. DRYMONIA Mart.

Drymonia spectabilis (H. B. K.) Mart. has been collected on the Atlantic slope. It is a small epiphytic shrub, often more or less scandent, with thick, usually dentate, oblong to elliptic leaves which are very rough on the upper surface. The dull dark red corolla, about 5 cm. long, has dentate rounded lobes, and the calyx lobes are broad, thin, green, and usually dentate.

136. PINGUICULACEAE. Bladderwort Family

1. UTRICULARIA L. BLADDERWORT

Plants terrestrial, the leaves minute and inconspicuous; bracts peltate. Corolla yellow ---------- **1. U. pusilla** Vahl.
Plants floating in water, the leaves large, dissected into threadlike segments; bracts not peltate.
  Corolla yellow.
    Pedicels recurved; peduncles arising singly from the nodes of elongate floating stems ---------- **2. U. mixta** Barnh.
    Pedicels erect or ascending; peduncles solitary, slender, the stems radiating from their bases ---------- **3. U. obtusa** Swartz.
  Corolla purple ---------- **4. U. hydrocarpa** Vahl.

The plants have very slender stems, with flowers solitary or racemose on elongate scapes. The calyx is 2 to 5-lobed or parted, the corolla 2-lipped and spurred. There are 2 stamens, and a superior 1-celled ovary. The fruit is a small capsule.

U. pusilla has been collected in savannas on the Pacific slope. *U. mixta* is plentiful about Gatún Lake, often forming large patches over quiet water. *U. hydrocarpa* grows in pools on the Pacific slope. In the last two species the leaves bear numerous small bladders. *U. obtusa* is said to have been collected at Lion Hill Station by Hayes.

137. ACANTHACEAE. Acanthus Family

Stamens 4.
  Plants usually scandent. Seeds 1 to 4, the retinacula papilliform.
    Fruit drupaceous, 1-seeded ---------- **1. MENDONCIA.**
    Fruit capsular, 2 or 4-seeded ---------- **2. THUNBERGIA.**
  Plants not scandent, usually erect. Seeds few and on hooklike retinacula, or numerous and on papilliform retinacula.
    Seeds numerous. Small viscid-villous annual herb; flowers in bracted spikes, the bracts mostly oblong; corolla about 4 mm. long. **3. STAUROGYNE.**
    Seeds few, usually 8 or fewer.
      Flowers axillary and solitary or clustered, or in loose terminal or axillary cymes or panicles, the bracts not conspicuous, usually linear.
        Corolla 2-lipped; flowers in dense axillary clusters. Plants glabrous or nearly so ---------- **4. HYGROPHILA.**
        Corolla not 2-lipped, the lobes subequal; flowers solitary or geminate in the axils or in loose cymes or panicles.
          Calyx lobes linear, attenuate; corolla very thin; herbs or small shrubs. **5. RUELLIA.**
          Calyx lobes oval, rounded at apex; corolla coriaceous; large shrub or tree ---------- **6. TRICHANTHERA.**
      Flowers all or mostly in dense terminal spikes, the bracts conspicuous, usually ovate or broader but sometimes oblong.
        Plants shrubs; corolla red ---------- **7. APHELANDRA.**

Plants usually herbaceous; corolla yellow or purple.

Corolla 2-lipped, 5 mm. long, purple; bracts mostly oblong. **8. LEPIDAGATHIS.**

Corolla with 5 nearly equal lobes, 15 mm. long or larger; bracts ovate or broader.

Corolla purple; bracts entire---------- **9. BLECHUM.**

Corolla yellow (bluish purple when dry); bracts dentate. **10. BARLERIA.**

Stamens 2.

Capsule many-seeded. Small herbs; flowers purple, small, in dense bracted spikes.

Peduncles of the spikes not bracted; bracts of the spikes thin, green, densely white-pilose---------- **11. NELSONIA.**

Peduncles covered with imbricate scalelike bracts; bracts coriaceous, glabrous or nearly so, with scarious appendages---------- **12. TUBIFLORA.**

Capsule with 8 or fewer seeds.

Corolla limb 5-lobed, the lobes subequal, spreading, the tube long and slender. Herbs or shrubs---------- **13. PSEUDERANTHEMUM.**

Corolla 2-lipped or with 4 subequal lobes.

Corolla with 4 subequal lobes, red. Large herb or shrub, glabrous or nearly so; flowers in raceme-like terminal panicles. **14. ODONTONEMA.**

Corolla 2-lipped.

Plants with woody branches; leaves often blotched with white or cream; cultivated species. Plants nearly glabrous; flowers large, red, in short terminal racemes---------- **15. GRAPTOPHYLLUM.**

Plants herbaceous; leaves green; native species.

Stems conspicuously 6-angled; calyx subtended by 2 partially united bracts. Large herb, nearly glabrous, the inflorescence glandular; corolla red---------- **16. DICLIPTERA.**

Stems terete or nearly so; bracts distinct.

Flowers yellowish white, in very dense spikes, the bracts large, 4-ranked, broadly ovate, obtuse---------- **17. TETRAMERIUM.**

Flowers purple or white, variously arranged, the bracts not 4-ranked, usually small and narrow.

Inflorescence headlike, the bracts white-hirsute, linear-subulate. Corolla purple---------- **18. CHAETOCHLAMYS.**

Inflorescence racemose, paniculate, or spicate, rarely headlike but the bracts then broad and obtuse; bracts not hirsute.

Corolla white, the tube much longer than the limb. Large herb; flowers in dense spikes, the bracts linear. **19. BELOPERONE.**

Corolla red, pink, or purple, the tube often shorter than the limb---------- **20. JUSTICIA.**

A few other genera are represented in Panama. The Acanthaceae are herbs or shrubs, rarely trees, the leaves opposite, usually entire or nearly so, without stipules. The perfect flowers are mostly irregular, often large and showy, the calyx inferior, with 5 or 4 distinct or united sepals. The corolla is gamopetalous, salverform or funnelform, the limb 5 or 4-lobed or 2-lipped. The 4 or 2 stamens are inserted on the corolla tube alternate with the lobes; the anthers are commonly 2-celled, and one of the cells frequently is inserted much below the other. The fruit is a capsule (baccate in *Mendoncia*), 2-celled, with few or numerous seeds. The seeds are usually attached by an indurate hooklike funicle (retinaculum), and the capsule is nearly always constricted below into a thick stipe.

1. MENDONCIA Vell.

Mendoncia retusa Turrill, of infrequent occurrence in moist woods, is a coarse herbaceous vine with long-petioled, elliptic or oval, caudate-acuminate, nearly glabrous leaves. The axillary flowers are white with purple veins. The black, plumlike drupes are nearly 2 cm. long.

2. THUNBERGIA Retz.

Plants scandent; leaves broadly angulate-cordate_______1. **T. grandiflora** Roxb.
Plants erect; leaves lanceolate to ovate, acute or obtuse at base.
2. **T. erecta** (Benth.) Anders.

Thunbergia grandiflora is an Indian species, sometimes planted about the zone as a vine over porches. It is a showy plant, with flowers about 8 cm. long in elongate racemes. The typical form has blue flowers, but that grown here has white blossoms. In Salvador this species is said to be known as "Emperatriz Eugenia."

T. erecta, an African species occasionally planted for ornament, is a large glabrous shrub, the solitary axillary flowers 5 to 6 cm. long and either blue or pure white. In Salvador it is called "cuerno" and "Nazaret."

3. STAUROGYNE Wall.

The only Central American species, *S. repens* (Nees) Kuntze, has been collected in a field near Juan Díaz, but seems to be rare. It is a small, very viscid annual with elliptic or ovate leaves, the small flowers in dense leafy-bracted spikes. The same plant occurs also in Nicaragua. There is some doubt with regard to its specific determination.

4. HYGROPHILA R. Br.

Hygrophila conferta Nees is of rather frequent occurrence, growing usually at the margins of small streams. It is a branched, nearly glabrous, very leafy, perennial herb, the stems often rooting at the nodes, the leaves linear-lanceolate. The small white flowers are densely clustered in the leaf axils. The local name is "flor de garza."

5. RUELLIA L.

Flowers pale purple, solitary and sessile in the leaf axils; plants puberulent or hirtellous___________________________________1. **R. geminiflora** H. B. K.
Flowers rose or red, in loose or headlike cymes.
  Plants glandular-pilose; flowers in loose cymes_________2. **R. albicaulis** Bert.
  Plants glabrate; flowers in long-stalked headlike clusters__3. **R. fulgida** Andr.

Ruellia geminiflora is frequent on the Pacific slope, usually in grassland. It is a small perennial herb, somewhat suggestive of a petunia, with oblong or lanceolate leaves. The flowers are about 3 cm. long.

R. albicaulis is common in thickets of the Pacific slope, a coarse bushy herb, often a meter high or more, with pale brittle branches and long-petioled ovate leaves, the flowers 3 cm. long. When crushed the plant exhales a strong and highly disagreeable goatlike odor. In Honduras it is called "año con año"; in Salvador "hierba de cabra" and "chancho de monte."

R. fulgida has been collected on the Atlantic slope.

Other species of *Ruellia* are known from Panama.

6. TRICHANTHERA H. B. K.

The genus consists of a single species, *T. gigantea* (H. B. K.) Humb. & Bonpl., a tree of 4 to 6 meters, which is common along streams and in wet forest. It has long-petioled, ovate or elliptic, nearly glabrous leaves, and large flowers in terminal, usually one-sided thyrses or corymbs. The corolla is dark red, 4 cm. long, and sericeous outside on the limb. The local name is "palo de agua."

7. APHELANDRA R. Br.

Bracts green, acuminate, closely appressed.
  Bracts laciniate........................1. **A. deppeana** Schlecht. & Cham.
  Bracts entire...............................2. **A. tetragona** (Vahl) Nees.
Bracts orange-red, entire, rounded or obtuse at apex, lax.
3. **A. sinclairiana** Nees.

Other species grow in Panama. They are large shrubs with mostly obovate or oblanceolate, acuminate, hairy, entire leaves. The red flowers, 4 to 5 cm. long, arranged in long dense bracted spikes, are handsome and showy.

A. deppeana, a common shrub of Pacific slope thickets, has bright red flowers. In Nicaragua the plant is called "chamoltaco;" in Salvador "palo de golpe," "cordoncillo," and "oreja de coyote." *A. tetragona* grows on the Atlantic slope. *A. sinclairiana*, frequent in wet Atlantic forests, is a shrub of 2 to 5 meters, very conspicuous in the dense forest because of its large spikes with their vivid orange-red bracts and pale or purplish red, long, tubular corollas.

8. LEPIDAGATHIS Willd.

The only Central American species, *L. alopecuroides* (Nees) Lindau, is common in moist woods and thickets, and sometimes occurs as a weed in gardens. It is a small perennial herb with broad, villosulous, obtuse or acute leaves, the very small, purplish flowers in dense spikes 1 cm. thick. The narrow bracts are hispidulous and strongly nerved.

9. BLECHUM Juss.

Leaves linear-lanceolate, long-attenuate at base, 0.5 to 1.5 cm. wide.
1. **B. panamense** Lindau.
Leaves ovate or lanceolate, rounded to acute at base, mostly 1.5 to 4 cm. wide.
2. **B. pyramidatum** (Lam.) Urb.

The plants are perennial herbs with entire or undulate, more or less pubescent leaves. The purple or pale violet flowers, 2 to 2.5 cm. long, are in dense headlike spikes, with broadly ovate, green bracts.

B. panamense, endemic in Panama and frequent here in moist woods, is a slender erect plant. *B. pyramidatum* (*B. brownei* Juss.), one of the most abundant weeds of tropical America and plentiful here nearly everywhere, is a weak herb, usually decumbent, but sometimes erect. It is probable that two species are represented by the Panama specimens referred here, but it is difficult to distinguish them definitely. This plant is said to be known in Panama as "brinca-brinca." In Salvador it is called "cuchansayo," "corredora," and "corre-flusión."

10. BARLERIA L.

The only Central American species, *B. micans* Nees, of occasional occurrence in moist forest, is a coarse herb, sometimes a meter high, with large lanceolate appressed-hirsute leaves. The showy yellow flowers, 4 cm. long, form dense terminal spikes. The bracts are broadly ovate, 4-ranked, laciniate, and hirsute.

The plant is remarkable because of the fact that the flowers turn purple in drying.

11. **NELSONIA** R. Br.

The only species is *N. brunelloides* (Lam.) Kuntze, a common plant in fields and moist places. It is a small pubescent perennial herb, often with rooting branches, the leaves mostly ovate, sometimes toothed, the tiny purple flowers in dense spikes nearly 1 cm. thick. The bracts are softly white-hairy, green, ovate, and closely imbricate.

12. **TUBIFLORA** Gmel.

The only Central American species is *T. squamosa* (Jacq.) Kuntze (*Elytraria tridentata* Vahl), one of the commonest tropical American plants and frequent about the zone. It is essentially an annual, 20 to 50 cm. high, with obovate or oblanceolate leaves, mostly crowded near the base of the plant. The flowering branches are long, slender, and wiry, covered with green overlapping bracts so as to resemble the twigs of some conifers. The purple corollas are small and inconspicuous, the flower spikes about 6 mm. thick. In Salvador the plant is called "coquillo," "cacahuillo," "trencilla," and "guacoco." The first name is given because of a remote resemblance of the plant to a diminutive coconut palm. The plant is much used in Salvador as a remedy for dysentery and stomach affections.

13. **PSEUDERANTHEMUM** Radlk.

Pseuderanthemum cuspidatum (Nees) Radlk., which has been collected at Alhajuela, is a small, nearly glabrous, perennial herb. The leaves are ovate, abruptly contracted below to a long margined petiole. The white flowers, 3 cm. long, with very slender tube, form interrupted terminal spikes.

One or more Old World species of this genus are planted for ornament about the zone. They are glabrous shrubs with ovate or elliptic leaves and terminal panicles of showy, white or red flowers. In one form the leaves are red-purple and the flowers red; in the other the leaves are green and the flowers white. Both may be referable to *P. pulchellum* Merr.

14. **ODONTONEMA** Nees

Odontonema flagellum (Oerst.) Kuntze, collected in woods on the Atlantic slope, is a shrub or tall herb, glabrous or nearly so, with large oblong-lanceolate leaves. The handsome, bright red flowers, 3 cm. long, form elongate spikelike terminal racemes.

One or more additional species are known from Panama.

15. **GRAPTOPHYLLUM** Nees

Graptophyllum pictum (L.) Griffith, planted frequently for ornament, is an Old World plant, although its native habitat is not known definitely. It is a glabrous shrub with large elliptic leaves, which are sometimes green but usually blotched with cream. The crimson flowers are 4 cm. long.

16. **DICLIPTERA** Juss.

Dicliptera assurgens (L.) Juss. is frequent in thickets, a large, slender, branched, nearly glabrous herb with green stems. The leaves are mostly ovate, but they wither and fall at an early stage, so that the mature plants are often leafless. The flowers are red, 3 cm. long, remote and sessile along the long slender branches of the inflorescence. In Salvador the plant is called "tinta montañés."

17. TETRAMERIUM Nees

Tetramerium hispidum Nees, occasional in brushy places near the Pacific coast, is a slender pubescent herb with brittle branches and long-petioled ovate leaves, the small, creamy white flowers arranged in dense spikes. The broad bracts are strongly nerved and ciliate with long white hairs.

18. CHAETOCHLAMYS Lindau

The only Central American species, *C. panamensis* Lindau, is frequent in moist woods. It is a slender erect perennial herb with petioled glabrous leaves. The showy purple flowers, 3 cm. long or more, are in dense terminal heads, which have long linear hairy bracts.

19. BELOPERONE Nees

Beloperone urophylla Lindau has been collected near Empire, and grows elsewhere in Panama. It is a large herb with oblong-lanceolate to oblong-elliptic, glabrous leaves, the white flowers, 4 cm. long, in short dense terminal spikes.

20. JUSTICIA L.

Flowers 2 to 4 cm. long or larger.
  Corolla red; flowers in open panicles; bracts inconspicuous, linear or lanceolate, acuminate .... **1. J. secunda** Vahl.
  Corolla purple; flowers in short dense spikes; bracts large, green, spatulate, obtuse .... **2. J. carthaginensis** L.
Flowers less than 1 cm. long, white, pink, or purple; flowers sessile and remote on the slender panicle branches.
  Corolla 8 mm. long; panicle dichotomous .... **3. J. pectoralis** Jacq.
  Corolla 5 mm. long or less; panicle branches opposite or whorled. **4. J. comata (L.) Lam.**

The Justicias are small or large herbs with inconspicuous or showy flowers and lanceolate or ovate leaves. Other species occur in Panama.

J. secunda, frequent in moist woods and thickets, especially along streams, is a large herb, frequently 1.5 meters high, rather conspicuous because of its red flowers. The local name is "canilla de pollo." *J. carthaginensis* is common in thickets. The local names "hierba borriguera" and "negrajora" were given for it on Taboga. In Salvador the plant is known commonly as "hierba del susto," also as "hierba de la Santísima Trinidad," and is employed as a remedy for convulsions in children.

J. pectoralis is frequent in moist woods and thickets. On Taboga Island it is called "curía." *J. comata* is common in wet soil.

138. RUBIACEAE. Madder Family

A. Plants herbaceous.
  Plants scandent; corolla red. Seeds numerous, winged .... **9. MANETTIA.**
  Plants not scandent: corolla not red.
    Fruit a berry or drupe, fleshy. Flowers capitate.
      Fruit many-seeded; leaves not cordate at base .... **17. TONTANEA.**
      Fruit containing two 1-seeded stones; leaves cordate at base. **34. GEOPHILA.**
    Fruit dry.
      Fruit containing numerous seeds.
        Leaves opposite; corolla lobes valvate .... **3. OLDENLANDIA.**
        Leaves ternate; corolla lobes contorted .... **7. LIMNOSIPANEA.**

Fruit 2 to 4-se
Stipules not bristly; flowers in cymes----------39. **DECLIEUXIA.**
Stipules furnished with bristles; flowers not in cymes.
Fruit circumscissile----------42. **MITRACARPUS.**
Fruit not circumscissile.
Fruit 3 or 4-celled----------43. **RICHARDIA.**
Fruit 2-celled.
Cells of the fruit not opening at maturity----------44. **DIODIA.**
Cells of the fruit, or at least one of them, opening at maturity.
Cells of the fruit opening at the base; flowers in axillary clusters----------45. **HEMIDIODIA.**
Cells coherent at base, opening above.
Cells of the fruit unlike, one opening, the other remaining closed----------46. **SPERMACOCE.**
Cells of the fruit alike, both opening at maturity.
47. **BORRERIA.**

AA. Plants trees or shrubs with woody stems.
B. Ovules more than one in each cell of the ovary.
Calyx lobes unequal, one lobe in some of the flowers expanded into a large, leaflike, red or white limb.
Enlarged calyx lobe white; seeds winged----11. **CALYCOPHYLLUM.**
Enlarged calyx lobe red; seeds not winged.
Corolla lobes valvate; flowers in small broad cymes--2. **POGONOPUS.**
Corolla lobes imbricate; flowers in long narrow panicles.
4. **WARSCEWICZIA.**
Calyx lobes equal or nearly so, never expanded into a leaflike colored limb.
Plants scandent. Flowers in axillary heads or cymes----18. **SABICEA.**
Plants erect.
Fruit dry, capsular.
Flowers in long spikes----------8. **ALSEIS.**
Flowers not in spikes.
Corolla large, the slender tube 10 to 16 cm. long--6. **LINDENIA.**
Corolla 5 cm. long or less.
Corolla asymmetric, about 5 cm. long, the limb very oblique. Capsule large, compressed----------12. **COUTAREA.**
Corolla symmetric, much smaller, the limb not oblique.
Seeds winged. Corolla pink------10. **MACROCNEMUM.**
Seeds not winged.
Corolla lobes valvate in bud; corolla red-purple.
1. **RUSTIA.**
Corolla lobes imbricate; corolla white---5. **RONDELETIA.**
Fruit fleshy, juicy, baccate.
Flowers in elongate spikes or spikelike panicles. Fruit small, 5 mm. or less in diameter----------14. **GONZALAGUNIA.**
Flowers not in spikes or spikelike panicles.
Leaves very large, with numerous fine parallel nerves between the principal veins; simple shrubs. Flower axillary.
16. **PENTAGONIA.**
Leaves without fine paralled nerves between the principal veins; stems usually much branched.
Flowers in many-flowered thyrsiform panicles or in large cymes; fruit small, usually less than 1 cm. long.
Corolla lobes valvate; flowers in thyrsiform panicles; fruit 4 to 6-celled----------15. **ISERTIA**

Corolla lobes imbricate; flowers secund upon the elongate branches of the large cymes or panicles; fruit 2-celled.

Fruit red or black; corolla red or yellow; flowers in short cymes-------------------------------**24. HAMELIA.**

Fruit blue; corolla whitish; flowers in long narrow panicles. **25. BERTIERA.**

Flowers solitary or in small few-flowered cymes.

Corolla with a slender tube 12 to 16 cm. long, curved in bud. **19. POSOQUERIA.**

Corolla tube less than 12 cm. long, not curved in bud.

Flowers terminal, dioecious; plants unarmed.

Stipules united into a conic cap, deciduous from the base; flowers in cymes----------------**21. AMAIOUA.**

Stipules free or united at base; flowers sessile in terminal clusters-----------------------**23. ALIBERTIA.**

Flowers mostly axillary, perfect or dioecious; plants often armed with spines.

Corolla villous in both throat and base; trees, unarmed. **20. GENIPA.**

Corolla villous in throat or base but not in both; shrubs, usually armed with spines----------**22. RANDIA.**

BB. Ovules one in each cell of the ovary.

Plants scandent, armed with recurved spines. Flowers in globose heads. **13. OUROUPARIA.**

Plants not scandent, unarmed or with straight spines.

Stipules with numerous setiform appendages. Leaves subsessile; flowers cymose-paniculate--------------------------------**35. RUDGEA.**

Stipules never with numerous setiform appendages.

Fruit dry, separating at maturity into 2 cocci----**26. MACHAONIA.**

Fruit fleshy.

Fruit strongly compressed, white. Flowers small, white, in axillary panicles---------------------------------**31. CHIOCOCCA.**

Fruit not at all or only slightly compressed.

Flowers in dense heads surrounded by large, green or colored bracts.

Flowers confluent by the ovaries in age-------**41. MORINDA.**

Flowers not confluent--------------------**36. CEPHAELIS.**

Flowers never in heads surrounded by large bracts.

Plants armed with spines. Flowers in small pedunculate cymes; fruit black, 1 cm. long--------------**28. CHOMELIA.**

Plants unarmed.

Fruit 1-seeded. Flowers long-pedicellate, in terminal corymbs. **40. FARAMEA.**

Fruit 2 to 5-seeded.

Fruit about 1.5 cm. long, red; flowers clustered in the axils of the leaves, white-----------------**32. COFFEA.**

Fruit usually less than 1 cm. long; inflorescence various.

Anthers long-exserted; flowers secund. Tree with large appressed-hairy leaves--------**29. PITTONIOTIS.**

Anthers not long-exserted; flowers usually not secund.

Seeds pendulous, the radicle superior; flowers in axillary cymes or panicles.

Corolla lobes valvate; flowers in panicles. **27. MALANEA.**

Corolla lobes imbricate; flowers in axillary cymes.
30. GUETTARDA.
Seeds ascending, the radicle superior; flowers usually terminal but sometimes axillary.
Corolla lobes contorted; introduced shrubs with showy flowers, planted for ornament.
33. IXORA.
Corolla lobes valvate; native plants.
Corolla tube straight, not gibbous; inflorescence various................**37. PSYCHOTRIA.**
Corolla tube curved or gibbous; inflorescence a terminal thyrsiform panicle.
38. PALICOUREA.

Several other genera are represented in Panama. The family is one of the largest in Central America, and its members are usually easy to recognize by the combination of opposite leaves, stipules, gamopetalous corolla, and inferior ovary. The Rubiaceae are herbs, shrubs, or trees, and some have showy inflorescence, although more commonly the flowers are small and inconspicuous.

One of the important genera is *Cinchona*, some of whose species furnish Cinchona bark, from which quinine is extracted. No species of *Cinchona* are known from Central America, but they occur in Colombia.

1. RUSTIA Klotzsch

The only North American species, *R. occidentalis* (Benth.) Hemsl., was collected near Chagres by Fendler. It is a shrub or small tree with oblanceolate long-acuminate leaves and terminal panicles of small red-purple flowers.

2. POGONOPUS Klotzsch

The only North American species, *P. speciosus* (Jacq.) Schum., occasional in moist forest, is a tree about 6 meters high with thin obovate acuminate leaves and cymose flowers. One lobe of the calyx is expanded into a large rounded-ovate leaflike crimson limb. The tubular crimson corolla is 3 cm. long. The large calyx lobes make the tree brilliant when in flower, and it is one of the most beautiful of Panama trees. In Salvador it is known as "chorcha de gallo."

3. OLDENLANDIA L.

Leaves rounded-ovate; plants perennial..........**1. O. callitrichoides** Griseb.
Leaves linear; plants annual.
Flowers in few-flowered axillary cymes................**2. O. corymbosa** L
Flowers solitary on long axillary pedicels................**3. O. herbacea** L.

The Oldenlandias are small herbs with minute, white or pink flowers. *O. corymbosa* and *O. herbacea* are common weeds. *O. callitrichoides* grows on damp walls about Panama City, where it is said to be known as "hierba de cui."

4. WARSCEWICZIA Klotzsch

The single North American species, *W. coccinea* (Vahl) Klotzsch, is occasional in forests. It is a shrub or small tree with large obovate leaves and small cymes of flowers in long narrow panicles. One calyx lobe in one flower of each cyme is expanded into a large, oblong or elliptic, bright red, leaflike blade. In general appearance the plant closely resembles *Pogonopus*, but may be distinguished by the narrow elongate inflorescence.

5. RONDELETIA L.

Rondeletia panamensis DC. is frequent in woods and thickets on the Pacific slope. The species is endemic in Panama, and is said to be known as "candelo." It is a shrub with ovate leaves and terminal cymes of unattractive white flowers.

Several other species are found in Panama, and there are numerous representatives of the genus in the mountains of Central America, some of them with handsome pink or red blossoms.

6. LINDENIA Benth.

The only species, *L. rivalis* Benth., has been collected along the river at Alhajuela. It is a low shrub with linear-oblanceolate leaves and showy white flowers. The slender corolla tube is 10 to 16 cm. long.

7. LIMNOSIPANEA Hook. f.

The only North American species, *L. palustris* (Seem.) Hook. f., was collected once in a swamp near Panama City, but has not been found again. It is a perennial herb with hirsute stems, ternate sessile ovate-lanceolate leaves, and terminal cymes of small pink flowers.

8. ALSEIS Schott

The single Central American species, *A. blackiana* Hemsl., is occasional in forests. It is a tree with obovate-oblong leaves and long spikes of small white flowers.

9. MANETTIA Mutis

Manettia coccinea (Aubl.) Willd., a common herbaceous vine, has ovate acuminate petioled leaves. The flowers are axillary, the corolla about 2 cm. long and pale red.

10. MACROCNEMUM P. Br.

Macrocnemum glabrescens (Benth.) Wedd., a shrub or tree, sometimes reaching a height of 15 meters, is rather infrequent in wet forests of the Atlantic watershed. The leaves are obovate and the pink flowers in ample panicles.

One other species, *M. pastoense* Karst., has been collected in Darién.

11. CALYCOPHYLLUM DC.

The only North American species, *C. candidissimum* (Vahl) DC. (pl. 64), is a common tree on the Pacific slope, growing to a height of 15 meters or more. The leaves are elliptic or ovate, the flowers in terminal corymb-like panicles. One lobe of the calyx in some of the flowers is expanded into a broad, rounded, creamy white, leaflike blade. When in blossom the tree presents an almost unbroken mass of white, and is both striking and handsome. The calyx lobes persist for a long time, so that the tree is conspicuous for months.

About the zone it is known as "alazano" and "harino," and elsewhere in Panama as "salamo," "madroño," and "guayabo alazano." The names "salamo" and "madroño" are widely used in Central America, and in Mexico the tree is called "camarón." The heavy, strong, and very fine-grained wood is used for many purposes. Fine-toothed combs are often made from it, and about Chepo it is burned for charcoal. The wood is said to be very resistant to teredo.

12. COUTAREA Aubl.

Coutarea hexandra (Jacq.) Schum., frequent in thickets, is a shrub or small tree, 3 to 6 meters high, with ovate leaves and few-flowered cymes. The corolla is about 5 cm. long, purplish white or greenish, very oblique, and the stamens long-exserted. The capsule is strongly compressed, obovate, 2.5 to 4.5 cm. long, with numberous white lenticels. In Salvador the tree is known as "quina," and the bitter bark is employed as a remedy for fevers.

13. OUROUPARIA Aubl.

The only North American species, *O. tomentosa* (Willd.) Schum., is frequent in wet forests of the Atlantic slope. It is a coarse woody vine, armed with stout hooked spines. The leaves are oval or ovate and acute; the small, yellow, very fragrant flowers are arranged in dense spherical heads.

Ourouparia is closely related to *Cephalanthus*, the buttonbush of the United States.

14. GONZALAGUNIA Ruiz & Pav.

Leaves nearly sessile, rounded at base; fruit white..........1. **G. rudis** Standl.
Leaves petioled, 5 to 20 cm. long, acute or obtuse at base; fruit black-purple.
2. **G. panamensis** (Cav.) Schum.

These are slender shrubs with lanceolate or ovate leaves and small white flowers in long spikes or spikelike panicles. The small fruit in juicy and 4-lobed. *G. rudis* is known here as "nigüita." *G. panamensis* was described from specimens collected by Née on Ancón Hill.

The genus has been known also under the names *Gonzalea* and *Duggena*.

15. ISERTIA Schreb.

The only Central American species, *I. haenkeana* DC., is a common shrub in thickets. The leaves are obovate, 20 to 50 cm. long, and the flowers in large terminal panicles, the corolla 2 to 3.5 cm. long, bright yellow, tinged with red. The juicy fruit is at first red but purple-black at maturity. When in flower the plant is showy, and the flowers are often gathered for decorative purposes. At Chepo the plant is known as "canelito."

16. PENTAGONIA Benth.

Leaves velvety-pubescent..........................1. **P. pubescens** Standl.
Leaves glabrous or appressed-pilose beneath along the veins.
2. **P. macrophylla** Benth.

These species are simple shrubs with very large, obovate, petioled leaves. The flowers are borne in dense axillary cymes, furnished with red bracts; the corolla is yellowish white. Several other species occur in Panama, some of them with pinnatifid leaves. Both the species listed are common in forests of the Atlantic slope. *P. macrophylla* (pl. 65) is called "hoja de murciélago."

17. TONTANEA Aubl.

Flower clusters sessile. Stems and leaves pubescent.
1. **T. herbacea** (Lam.) Standl.
Flower clusters on long peduncles.
  Stems and leaves copiously pubescent..............2. **T. guianensis** Aubl.
  Stems and leaves glabrous....................3. **T. glabra** (DC.) Standl.

The plants are creeping herbs with petioled, ovate or elliptic leaves, the small bluish flowers in axillary heads, the fruit a blue berry. *T. glabra* is an endemic species, and *T. herbacea* has been found within our limits only near Fort Randolph.

Coccocypselum is the generic name which has been most generally used for this group.

18. SABICEA Aubl.

Flowers sessile .... 1. **S. hirsuta** H. B. K.
Flowers pedicellate .... 2. **S. panamensis** Wernh.

The Sabiceas are woody vines with ovate to oblong, acute or acuminate leaves, the small white flowers in axillary heads or cymes. Typical *S. hirsuta* has hirsute stems. The form occurring in Panama is *S. hirsuta* var. *adpressa* Wernh., with appressed pubescence.

19. POSOQUERIA Aubl.

Posoqueria latifolia (Rudge) Roem. & Schult. (pl. 66), the only North American species, is frequent in forests and thickets. It is a glabrous shrub or tree, often 6 meters high, with thick, dark green, oval or oblong leaves, and white flowers in terminal corymbs. The very slender corolla tube is 12 to 16 cm. long, the lobes 1.5 to 2.5 cm. long. The yellow fruit looks like a small orange. When in flower the tree is a showy and handsome one, and it is planted in Ancón. The names given in Panama to this tree are "borajó," "boca vieja," "fruta de mono," "huevo de mono," and "fruta de murciélago." In Costa Rica it is called "guayaba de mico."

20. GENIPA L.

Leaf blades narrowed to an obtuse base; secondary nerves parallel between the lateral veins .... 1. **G. maxonii** Standl.
Leaf blades narrowed to a very acute base; secondary nerves irregularly reticulate. 2. **G. americana** L.

One other species, *G. williamsii* Standl., is known from Panama. The plants are trees with large obovate leaves, the flowers white or yellowish and mostly in small terminal cymes. The fruit is large (5 to 7 cm. or more in diameter), globose, with juicy pulp and numerous large, flat, closely packed seeds.

The type of *G. maxonii* was collected along the Río Indio de Gatún. The wood of this tree turns bright pink when cut, a coloration characteristic also of some other plants of the family.

G. americana, or rather the form with densely pubescent leaves, *G. americana* var. *caruto* (H. B. K.) Schum., is a common and well-known tree of Mexico and Central America. The wood is strong and resistant, flexible, whitish, tinged with gray, and useful for many purposes. The bark is reported rich in tannin. The fruit is brownish, with a leathery skin and scant acid pulp, which is edible. The juice has been fermented to produce an intoxicating beverage. Upon cloth or other articles the juice produces a brownish or blackish, permanent stain, hence it was much used by the primitive inhabitants of the region for dyeing, and especially for painting the body. In Panama the tree is called "jagua," a name known almost throughout its range. In Guatemala and Salvador it is called more commonly "irayol," in Mexico, among other names, "maluco," and in Venezuela "caruto."

21. AMAIOUA Aubl.

About the zone *A. corymbosa* H. B. K., the only North American species, seems to be known only from Ancón Hill. It is a tree 4 to 9 meters high, with oval or elliptic, acuminate leaves, and small (1 cm. long) white dioecious flowers in terminal cymes. The fruit is an oval many-seeded black berry 1.5 cm. long. According to Pittier, the tree is known in some parts of Panama as "madroño."

22. RANDIA L.

Plants unarmed. Corolla tube 6 to 11 cm. long; fruit 2.5 to 3 cm. long.
1. **R. formosa** (Jacq.) Schum.

Plants armed with spines.
  Corolla tube 2.5 to 6 cm. long; fruit 2.5 to 3.5 cm. long; leaves acute or acuminate.
    Corolla glabrous outside ____________________ 2. **R. armata** (Swartz) DC.
    Corolla densely sericeous outside ________________ 3. **R. lasiantha** Standl.
  Corolla tube 5 mm. long or less; fruit about 1 cm. in diameter; leaves usually rounded at apex __________________________________ 4. **R. mitis** L.

The Randias are shrubs with broad leaves. The flowers are perfect or dioecious, white or yellowish, sessile and axillary or terminal. The fruit contains pulp and numerous seeds.

R. lasiantha is an endemic species, collected only at Alhajuela. *R. armata* is known here, also in Honduras and Guatemala, as "rosetillo"; in Mexico it is called "huele de noche," "palo de la cruz," and "jazmín"; in Salvador "crucito," "jicarillo," "crucetilla," and "torolillo." The pulp of the fruit is edible. *R. mitis* (of which *R. aculeata* L. is a synonym) has been found here only in thickets along the Atlantic shore. Its fruit also is edible. This is a widely distributed species, known in Salvador as "crucito" and "tintero"; in Mexico as "crucilla," "crucecilla," and "papachilla"; in Colombia as "maíz tostado"; and in Cuba as "yamaguey."

23. ALIBERTIA A. Rich.

The only North American species, *A. edulis* (L. Rich.) A. Rich., is a very common shrub in moist forests. The leaves are dark green, lance-oblong, acuminate, and glabrous, the flowers white, dioecious, and sessile in terminal clusters. The fruit is yellowish at maturity, globose, about 2.5 cm. in diameter, and many-seeded. Boys often use the hard green fruits, with a stick thrust through them, as tops. The shrub is known locally as "lagartillo," "trompo," and "trompito," and among the Barbadians as "wild guava." It is also called "madroño" and "madroño de comer" about the zone and in Costa Rica; in Guatemala "guayaba del monte"; and in Salvador "torolillo."

The leaves on young sprouts or seedlings of this shrub are handsomely colored with purple and pink, and much narrower than in the mature plant. These seedlings are often abundant and conspicuous in the forests.

A. longistipulata Riley and *A. panamensis* Riley, recently described from the Pacific slope, appear to be forms of *A. edulis.*

24. HAMELIA Jacq.

Calyx lobes oblong, longer than broad; leaves opposite, nearly glabrous.
1. **H. axillaris** Swartz.

Calyx lobes deltoid, as broad as long; leaves mostly ternate.
  Cymes 1 to 4-flowered __________________________ 2. **H. pauciflora** Standl.
  Cymes many-flowered.
    Leaves glabrous beneath except sometimes along the costa.
3. **H. nodosa** Mart. & Gal.
    Leaves copiously pubescent beneath _________________ 4. **H. erecta** Jacq.

The Hamelias are shrubs with opposite or whorled, petiolate, mostly ovate leaves. The flowers are yellow, orange, or red, in cymes with one-sided branches. The fruit is a 5-celled red or black berry, the corolla tubular or funnelform.

H. pauciflora is known only from Panama. *H. erecta* (*H. patens* Jacq. is a synonym) is very common here and widely distributed in tropical America. Its fruit is edible, but is seldom eaten. This species is known locally as "uvero"; in Costa Rica as "zorrillo," "zorrillo real," "palo camarón," and "añileto"; in Salvador and Honduras as "chichipince"; in Salvador as "coralillo"; in Honduras as "coral"; in Guatemala as "flor de cangrejo"; and in Cuba as "palo de coral."

25. **BERTIERA** Aubl.

Bertiera guianensis Aubl. is occasional in the forests of the Atlantic slope. It is a slender shrub about 3.5 meters high, with lance-oblong, nearly sessile, glabrate leaves, the small flowers borne in small secund cymes which are arranged in a long narrow panicle. The blue globose juicy fruit is 3 to 4 mm. in diameter.

26. **MACHAONIA** Humb. & Bonpl.

Machaonia acuminata Humb. & Bonpl., which grows in thickets near the Pacific, is a shrub or small tree, up to 6 meters high, with sharp-pointed spinelike sterile branchlets. The leaves are ovate, acuminate, pubsecent beneath, and petioled, and the small (corolla 4 to 5 mm. long) white flowers are arranged in terminal panicles. The fruit is dry, 5 mm. long, separating at maturity into 2 cocci. The local names are "espino" and "espino blanco."

Another species, *M. rotundata* Griseb., with nearly glabrous leaves, has been collected in Panama.

27. **MALANEA** Aubl.

Malanea erecta Seem. was described from Taboga Island, but only the original collection is known. It is a shrub with ovate-elliptic leaves and axillary panicles of small white flowers.

28. **CHOMELIA** Jacq.

Chomelia spinosa Jacq. is a spiny shrub or tree, 3 to 9 meters high, frequent in forests or thickets of the Pacific slope. The leaves are ovate or elliptic, the corolla yellowish white, with a slender silky tube 1 to 2 cm. long. The flowers are arranged in pedunculate cymes. The fruit is a black drupe 1 cm. long. The Barbadians in the zone call the plant "tom-bush."

29. **PITTONIOTIS** Griseb.

The genus consists of a single species, *P. trichantha* Griseb., described from Panama but extending into Colombia. It is a tree of 10 meters or less with large, ovate or obovate, thin, deciduous leaves, appressed-hairy beneath. The small whitish flowers are secund along the slender branches of the axillary panicles. The fruit is a drupe 5 mm. long. The vernacular name is "candelo."

30. **GUETTARDA** L.

Cymes 3-flowered, the peduncles very stout. Leaves mostly 5 to 6 cm. wide. **1. G. ramuliflora** Beurl.

Cymes usually with more than 3 flowers, the peduncles very slender.

Bractlets at base of flowers oblong, obtuse; leaves 10 to 16 cm. long; petioles 8 to 20 mm. long.......................**2. G. foliacea** Standl.

Bractlets lanceolate, acute; leaves 3 to 7 cm. long, the petioles 7 mm. long or less..................................**3. G. odorata** (Jacq.) Lam.

The Guettardas are shrubs with thin leaves. The flowers are small, greenish white, in axillary cymes, the fruit a drupe with scant flesh. *G. ramuliflora* and *G. foliacea* are known only from Panama, the latter from the Atlantic slope.

G. odorata, common in thickets on the Pacific slope, is known as "espino blanco" (although it is not spiny) and "huesito negro."

31. CHIOCOCCA P. Br.

Chiococca alba (L.) Hitchc., a widely distributed species, is common in woods and thickets. It is a weak, often subscandent shrub, with shining, ovate or lanceolate leaves, and small white flowers in axillary panicles. The fruit is orbicular, 4 to 8 mm. broad, flattened, and white. In Panama the shrub is known as "lágrimas de María; in Salvador as "lágrimas de San Pedro" and "aceitillo."

32. COFFEA L. Coffee

Coffea arabica L., the coffee usually grown in America, is the most important agricultural plant of Central America, or at least furnishes the most valuable article of export. It is grown extensively in Panama, but the country about the zone is too low for its successful culture. Nevertheless, there are small plantations on Taboga Island, which supply some of the coffee used there. The bushes have spread into the thickets, and they are found also on the mainland about the old settlements. The Spanish word for coffee is "café." The plant is a native of tropical Africa.

33. IXORA L.

Corolla red; leaves sessile, often cordate at base..............1. **I. coccinea** L.
Corolla white; leaves short-petioled, acute at base....2. **I. finlaysoniana** Wall.

Both species are natives of the East Indies. They are shrubs with terminal clusters of showy flowers, the corolla having a long, very slender tube. *I. coccinea* is one of the common ornamental shrubs of the zone. Its local name is "buquet de novia." *I. finlaysoniana* is in cultivation in Ancón and probably elsewhere. Pittier reports that it is called "lila" in Panama. In Salvador and Nicaragua it is known as "buquet de novia" and "corona de la reina."

34. GEOPHILA Don

The only Central American species, *G. herbacea* (L.) Schum., is frequent in woods and thickets. It is a creeping perennial herb with long-petioled cordate leaves, and axillary clusters of small white flowers on long peduncles. The juicy fruit is bright red or purple-black.

35. RUDGEA Salisb.

Rudgea fimbriata (Benth.) Standl. has been collected in forest near Frijoles. It is a shrub 2.5 to 3.5 meters high, with nearly sessile, oblong-obovate, long-acuminate leaves and terminal inflorescence. In general appearance it is much like some Psychotrias, but it may be distinguished readily by the laciniate-dentate stipules. One other species has been collected in Panama.

36. CEPHAELIS Swartz

Plants hirsute, 1.5 to 3 meters high. Flowers yellow, in dense heads subtended by large red bracts; fruits bright blue.....1. **C. tomentosa** (Aubl.) Vahl.
Plants glabrous or nearly so, rarely over 30 cm. high.
  Leaves long-petiolate; stipules bilobate...............2. **C. nana** Standl.
  Leaves subsessile; stipules with numerous subulate lobes.
    3. **C. ipecacuanha** (Brot.) Rich.

Other species occur elsewhere in Panama. *C. nana* is an endemic species, known only from hills near Frijoles.

In *C. tomentosa*, a common shrub, the red bracts of the flower head are very showy.

C. ipecacuanha furnishes at least a part of the ipecac of commerce. Locally the plant has been collected only on Barro Colorado Island, but doubtless it occurs elsewhere in the vicinity. It has been collected in eastern Chiriquí, and extends northward to Nicaragua and southward to Brazil. About the zone it is called "raicilla," and is used medicinally, but is probably not gathered for export. The drug ipecac is obtained from the dried roots, which are about 6 mm. thick. The plant is a shrub with simple stems bearing a few pairs of oblong-ovate or oblong-elliptic, acute leaves 10 to 15 cm. long. The inflorescence consists of a single small terminal long-stalked head subtended by small green bracts. The corolla is white, and the fruit contains two slightly twisted seeds.

The names *Evea* and *Uragoga* have been applied to this genus.

37. PSYCHOTRIA L

- Inflorescences axillary; stems usually simple.
  - Inflorescence few-flowered, subracemose; fruit blue; leaves puberulent beneath.
    - Leaves oblong-elliptic or oblong-obovate, short-petiolate, acute. 1. **P. emetica** L. f.
  - Inflorescence many-flowered, cymose or paniculate; fruit not blue; leaves glabrous beneath.
    - Leaves pale beneath, oblanceolate-oblong; fruit red. 2. **P. uliginosa** Swartz.
    - Leaves green beneath, oblong-lanceolate to elliptic; fruit white. 3. **P. anomothyrsa** Schum. & Donn. Smith.
- Inflorescences all or chiefly terminal; stems usually much branched.
  - Stipules green, persistent.
    - Fruit 5-celled. Leaves elliptic or oblong-elliptic, short-acuminate, decurrent at base, glabrous or puberulent beneath. 4. **P. racemosa** (Aubl.) Willd.
    - Fruit 2-celled.
      - Bractlets equaling or longer than the calyx.
        - Stipules longer than the petioles. Leaves elliptic or oblong, cuspidate-acuminate, the nerves coarse, whitish; fruit black. 5. **P. inundata** Benth.
        - Stipules shorter than the petioles.
          - Bractlets longer than the corolla, acute, plane; inflorescence few-flowered, dense; fruit black______6. **P. involucrata** Swartz.
          - Bractlets shorter than the corolla, obtuse, very concave; inflorescence many-flowered, open; fruit blue_______7. **P. brachiata** Swartz.
      - Bractlets shorter than the calyx.
        - Calyx truncate.
          - Leaves cuspidate-acuminate, oblong-ovate or elliptic; corolla 4 mm. long; fruit yellow, turning black______8. **P. cuspidata** Bredem.
          - Leaves acute or obtuse, obovate or obovate-oblong; corolla about 8 mm. long; fruit red____________9. **P. pinularis** Sessé & Moc.
        - Calyx conspicuously lobed.
          - Corolla pubescent outside.
            - Panicles erect; fruit purple-black__________10. **P. hebeclada** DC.
            - Panicles reflexed; fruit blue_______________11. **P. pittieri** Standl.
          - Corolla glabrous outside.
            - Stipules entire; leaves obovate to oblong-oblanceolate, attenuate at base____________________________12. **P. grandis** Swartz.

Stipules bilobate; leaves ovate-oblong, usually rounded or obtuse at base. Fruit white................**13. P. patens** Swartz.

Stipules thin, brownish, early deciduous from the base.

Flowers in few-flowered sessile heads surrounded by brown scarious bracts. Leaves obovate-elliptic, small, mostly 4 to 6 cm. long.

14. P. chagrensis Standl.

Flowers not in sessile heads surrounded by brown bracts.

Calyx lobes lance-linear. Leaves glabrous or sparsely puberulent beneath.

15. P. horizontalis Swartz.

Calyx lobes broadly ovate or triangular, or nearly obsolete.

Inflorescence sessile, branched from the base.

Leaves coriaceous, broadly rounded and apiculate at apex.

16. P. calophylla Standl.

Leaves thin, acute or acuminate.

Leaves large, mostly 8 to 12 cm. wide, broadly elliptic.

17. P. limonensis Krause.

Leaves smaller, less than 6 cm. wide, not broadly elliptic.

Leaves oblong-oblanceolate, broadest above the middle; flowers usually crowded into a few heads.

18. P. psychotriaefolia (Seem.) Standl.

Leaves elliptic-oblong, broadest at the middle; inflorescence open.

Branches of the inflorescence densely hirtellous; leaves hirtellous beneath.....................**19. P. undata** Jacq.

Branches of the inflorescence glabrous or puberulent; leaves glabrous or sparsely puberulent beneath.

20. P. granadensis Benth.

Inflorescence pedunculate.

Leaves coriaceous, rounded and obtuse-apiculate at apex, broadly obovate.............................**21. P. fendleri** Standl.

Leaves thin, acute or acuminate.

Flowers sessile or subsessile.

Leaves densely pubescent beneath, oblong-elliptic.

22. P. micrantha H. B. K.

Leaves glabrous beneath or nearly so, obovate-oblong.

23. P. carthaginensis Jacq.

Flowers pedicellate. Leaves usually glabrous.

Leaves small, 1 to 2 cm. wide; inflorescence few-flowered.

24. P. graciliflora Benth.

Leaves large, mostly 4 to 12 cm. wide.

Leaves broadly elliptic, mostly 8 to 12 cm. wide; pedicels shorter than the fruits.......**17. P. limonensis** Krause.

Leaves oblong-oblanceolate, mostly 4 to 5 cm. wide; pedicels longer than the fruits........**25. P. marginata** Swartz.

Numerous additional species occur elsewhere in Panama. The Psychotrias are shrubs with small, white, greenish, or yellowish flowers in terminal or axillary cymes, panicles, or corymbs. The fruit is a small juicy drupe, containing usually 2 one-seeded nutlets. This is the largest genus of the family, and is well represented in Central America. Most of the species are inconspicuous shrubs of little general interest.

P. emetica is frequent in forests, and is known locally as "raicilla" or "raicilla macho." It is a simple shrub, usually 30 to 40 cm. high. The roots are reported to yield a kind of ipecac. *P. anomothyrsa* has been found here only once, in forest between Frijoles and Monte Lirio. *P. uliginosa*, *P. racemosa*, and *P. inundata* (of which *P. albonervia* Standl. is a synonym) seem to be restricted to the Atlantic slope; likewise *P. brachiata*. *P. pinularis*, which is confined to the Pacific slope, is known in Mexico as "crucecilla." *P. hebeclada* is said to be known in Panama as "huesito." *P. grandis* and *P. chagrensis* are found in swamps near the Atlantic. *P. calophylla* is an endemic species, known only from specimens collected by Fendler near Chagres. *P. psychotriaefolia* also is endemic, but a rather common plant. *P. undata* is known locally as "huesito." *P. patens* is sometimes called "garricillo." *P. fendleri* has been collected in Panama only near the mouth of the Chagres, and *P. limonensis* and *P. graciliflora* are known only from the Atlantic slope. The other species listed are generally distributed.

Psychotria bimea Riley, recently described from the region, is *P. horizontalis* Swartz.

38. PALICOUREA Aubl.

Leaves in whorls of 3, copiously pubescent beneath; lobes of the stipules linear, acute..1. **P. parviflora** Benth.

Leaves opposite, glabrous beneath or nearly so; lobes of the stipules broad, obtuse..2. **P. guianensis** Aubl.

Other species occur in the mountains of Panama. They are shrubs with ample acuminate short-petioled leaves. The terminal inflorescence is a thyrse or corymbiform panicle with red or orange branches and yellow flowers. The fruit is juicy and black or purple.

39. DECLIEUXIA H. B. K.

Declieuxia mexicana DC., the single North American species, is known locally only from the grasslands of Ancón Hill and Taboga Island. It is an erect perennial, often somewhat woody, with shining lance-oblong leaves and small white flowers in terminal cymes.

40. FARAMEA Aubl.

Leaves coriaceous, oval, obtuse or rounded at base; pedicels 2.5 to 3 cm. long. 1. **F. luteovirens** Standl.

Leaves thin, oblong, acute at base; pedicels less than 2 cm. long. 2. **F. occidentalis** (L.) Rich.

Other species are known from the mountains of Panama. The plants are shrubs or small trees with short-petioled cuspidate leaves. The corymbose inflorescence is few-flowered and the corolla white. *F. occidentalis* is known in Panama as "huesito," and in Salvador as "cafecillo." The wood is hard, yellow, and close-grained. *F. luteovirens* is known only from Panama.

41. MORINDA L.

Corolla 10 mm. long; peduncles 3 to 10 mm. long; leaves mostly oblanceolate-oblong, 2 to 3.5 cm. wide................................1. **M. roioc** L.

Corolla 15 mm. long; peduncles 10 to 30 mm. long; leaves mostly elliptic, 4 to 10 cm. wide................................2. **M. panamensis** Seem.

Both species are shrubs or small trees, and *M. roioc* is often scandent. The white flowers are borne in small stalked heads. *M. roioc* has been collected near Colón, and *M. panamensis* is frequent in the swamps of the Atlantic coast.

42. MITRACARPUS Zucc.

The only Central American species, *M. hirtus* (L.) DC., is a common weed. It is an erect annual with oblong-lanceolate leaves and dense axillary clusters of minute white flowers.

43. RICHARDIA L.

Richardia scabra L., the single Central America species, is a common weed. It is an annual herb, usually procumbent, copiously pilose, with dense heads of small, white or pinkish flowers, surrounded by an involucre of leaflike bracts.

44. DIODIA L.

Leaves ovate to oblong-lanceolate, mostly 10 to 20 mm. wide, the margins not strongly involute.
  Flower heads in the axils of large leaves; fruit 3 to 4 mm. long.
    1. **D. sarmentosa** Swartz.
  Flower heads in long, nearly naked spikes, the subtending leaves much reduced; fruit about 1 mm. long..............2. **D. nudata** Standl.
Leaves linear or linear-lanceolate, 6 mm. wide or less, the margins strongly revolute. Flowers clustered in the axils of large leaves.
  Carpels of the fruit 3-ribbed on the back, glabrate or with a few coarse hairs, plane on the inner surface....3. **D. rigida** (H. B. K.) Schlecht. & Cham.
  Carpels 1-ribbed or smooth, densely covered with minute appressed hairs, bisulcate on the inner surface......................4. **D. teres** Walt.

The Diodias are annual or perennial herbs with small, white or pink flowers. *D. nudata* is known only from the vicinity of the zone. *D. rigida* and *D. teres* seem to be confined to the Pacific slope, chiefly to the savannas. The last species is common in many parts of the United States.

45. HEMIDIODIA Schum.

The only species, *H. ocimifolia* (Willd.) Schum., is a frequent weed. It is an herb with lanceolate leaves and small axillary clusters of white flowers.

46. SPERMACOCE L.

Capsule glabrous; corolla villous in the throat........1. **S. glabra** Michx.
Capsule pubescent; corolla not villous in the throat.......2. **S. tenuior** L.

The plants are annual herbs which turn dark in drying. The leaves are lanceolate or linear-lanceolate, and the minute white flowers in dense axillary clusters. Both species are occasional weeds about the zone.

47. BORRERIA Meyer

Style bifid at apex; leaves yellowish green, mostly elliptic or oblong-elliptic.
    1. **B. latifolia** (Aubl.) Schum.
Style not bifid; leaves dark green.
  Seeds transversely sulcate. Flower clusters chiefly terminal but also axillary; leaves ovate or lanceolate...............2. **B. laevis** (Lam.) Griseb.
  Seeds not transversely sulcate.
    Stamens included; leaves elliptic to lanceolate; stems often procumbent; flower clusters about 6 mm. in diameter, mostly axillary.
      3. **B. ocymoides** (Burm.) DC.
    Stamens exserted; leaves mostly linear or narrowly lanceolate; stems erect; flower clusters usually 10 mm. or more in diameter, chiefly terminal.
      Calyx lobes 4............4. **B. tenella** (H. B. K.) Schlecht. & Cham.
      Calyx lobes 2..............5. **B. spinosa** (L.) Schlecht. & Cham.

The Borrerias are annuals or perennials with minute white flowers in dense, axillary or terminal clusters. About the zone *B. tenella* seems to be confined to the Pacific slope, growing chiefly on the savannas. In Salvador and Guatemala this species is known as "hierba del toro." The other species are common weeds. *B. laevis* is said to be called "sanaltodo" and "hierba del pájaro" in Guatemala. *B. latifolia* is reported to be called "cansa-mozo" in Panama.

139. CAPRIFOLIACEAE. Honeysuckle Family

1. SAMBUCUS L. ELDER

Sambucus mexicana Presl is planted occasionally about houses. It is a species native of Mexico and some parts of Central America, a shrub or small tree with pinnate or bipinnate leaves, and large flat-topped cymes of small white fragrant flowers; the fruit is a small edible drupe containing 3 to 5 1-seeded nutlets. The usual name for the shrub in Central America is "sauco." The plant is used here in domestic medicine. Several species of the genus occur in the United States.

140. CUCURBITACEAE. Gourd Family

- Ovules and seeds horizontal.
  - Anther cells flexuous or conduplicate.
    - Corolla rotate or campanulate, 5-parted or with 5 petals.
      - Staminate flowers white, large, the tube long and slender. 1. **LAGENARIA.**
      - Staminate flowers yellow, the tube short and broad.
        - Anthers sessile in the middle of the calyx tube, dorsifixed. 2. **POSADAEA.**
        - Anthers on evident filaments, basifixed.
          - Stamens inserted in the mouth of the calyx; fruit elastically dehiscent. 3. **MOMORDICA.**
          - Stamens inserted on the tube of the calyx; fruit not elastically dehiscent.
            - Staminate flowers racemose; fruit dry, with a spongelike network of fibers within----------4. **LUFFA.**
            - Staminate flowers solitary or fasciculate; fruit fleshy, not fibrous.
              - Leaves deeply lobed; tendrils usually branched; connective not produced beyond the anther cells------5. **CITRULLUS.**
              - Leaves shallowly or not at all lobed; tendrils simple; connective produced beyond the anther cells--------6. **CUCUMIS.**
    - Corolla campanulate, lobed to about the middle.
      - Anthers free----------7. **SICANA.**
      - Anthers coherent.
        - Stamens inserted in the middle of the calyx tube----8. **PITTIERA.**
        - Stamens inserted at the base of the calyx tube------9. **CUCURBITA.**
  - Anther cells straight or slightly curved, not flexuous.
    - Flowers bright yellow or greenish yellow, the staminate racemose or corymbose; disk at base of style annular or cupular------10. **MELOTHRIA.**
    - Flowers red or orange, spicate or capitate or rarely racemose; disk none or obscure.
      - Calyx limb shortly 5-dentate; petals obovate or rounded; plants nearly glabrous----------11. **ANGURIA.**
      - Calyx limb 5-cleft; petals linear or triangular; plants hairy. 12. **GURANIA.**
- Ovules and seeds erect, ascending, or pendulous.
  - Ovules 3 or more, erect or ascending.
    - Fruit smooth; ovary not oblique----------13. **CAYAPONIA.**
    - Fruit spiny; ovary oblique.
      - Seeds orbicular; leaves digitately compound------14. **CYCLANTHERA.**

Seeds angulate-lobed; leaves simple.................15. **ELATERIUM.**
Ovule 1, pendulous.
Flowers dioecious; filaments free; styles 3. Fruit small, globose, fleshy.
16. **SICYDIUM.**
Flowers monoecious; filaments united as a column; style 1.
Fruit fleshy, large, usually not spiny; anthers free......17. **CHAYOTA.**
Fruit dry, small, spiny; anthers connate..............18. **SICYOS.**

The genus *Frantzia* is known from Chiriquí, and probably other genera occur in Panama. The Cucurbitaceae are usually scandent herbs, rarely woody, nearly always with coiling tendrils. The alternate leaves are petioled, simple or pedately compound. The flowers are monoecious or dioecious, yellow or white or rarely red and either small or large. The calyx tube is adnate to the ovary, the limb 5-lobed. The 5 petals are inserted on the calyx limb and either free or united. There are commonly 3 stamens of which one is 1-celled, the others 2-celled. The ovary is normally 3-celled but frequently 1-celled, the fruit (called a pepo) commonly baccate and indehiscent.

1. LAGENARIA Ser. CALABASH GOURD

The single species, *L. leucantha* (Lam.) Rusby, is probably native of tropical Asia and Africa, but it is grown commonly in Central America, and in some places has become naturalized. It is a coarse vine, readily recognized by the white flowers with corolla about 5 cm. long. The fruit is a large dry gourd with thin hard shell, of various forms, but the usual one in Central America is globose at one end and abruptly contracted into a long round handle. The fruits are employed for making dippers for drinking water and kitchen ladles and receptacles. The shells are widely used in South America for cups from which maté is drunk, and the African calabash pipes for smoking tobacco are made from this gourd. In some parts of Panama the plant is called "tula de mate"; in Salvador "tarro," "tecomate," "tecomatillo," and "tol"; in Mexico "bule" and "calabaza."

2. POSADAEA Cogn.

The only species, *P. sphaerocarpa* Cogn., is frequent in thickets, a coarse villous vine with deeply cordate, broad, remotely toothed or deeply lobed leaves. The flowers are yellow, the fruit globose and gourdlike, about 10 cm. in diameter. The local name is "brujito."

3. MOMORDICA L. BALSAM-PEAR

Momordica charantia L. is common in thickets, a slender weedy vine with small, deeply 5-lobed leaves and small yellow flowers solitary in the axils on long slender pedicels which bear a large leaflike bract. The fruit is oblong or fusiform and pointed, tubercled, orange, splitting open by 3 valves and exposing the red pulp in which the large seeds are imbedded. The white or dark brown seeds are curiously marked. The pulp is eaten by children, and in some regions the green fruits are cooked and eaten. In Panama the seeds are reputed poisonous. The plant is used somewhat in domestic medicine, the West Indians about the zone giving a tea made from the fruit as a remedy for fevers and to cause vomiting.

In Panama the plant is called "balsamino," a name used also in other regions. By the Barbadians it is called "surcy"; on the Atlantic coast of Costa Rica "sorosí"; in Salvador "bálsamo" and "balsamito"; in western Mexico "pepino."

4. LUFFA Adans. SPONGEGOURD

Fruit smooth; petals 2 to 3 cm. long.............. **1. L. cylindrica** (L.) Roem.
Fruit tuberculate or short-spiny; petals about 1 cm. long.
2. L. operculata (L.) Cogn.

The Luffas are coarse vines with broad, cordate, lobed or nearly entire leaves, the flowers yellow, the staminate in racemes, the pistillate solitary.

L. cylindrica, the spongegourd, is a native of the Old World tropics, but in Central America is often cultivated and frequently becomes naturalized. It is plentiful along the seashore near Balboa. The fruits are cylindrical and 30 to 60 cm. long, the interior filled with a coarse fibrous mass that resembles a marine sponge, for which it is substituted locally. These "sponges" are not infrequently found on seashores to which they are sometimes carried from long distances. In China and Japan the young tender fruits are eaten as a vegetable. The name used in Panama is "calabazo"; in other parts of Central America the names "paxte," "paishte," and "paste" are applied to this and to the closely related *L. acutangula* Roxb.

L. operculata has been collected at Matías Hernández, and is probably native. Its fruits are about as large as a hen's egg and have a long slender beak at the apex.

5. CITRULLUS Forsk. WATERMELON

The watermelon or "sandía," *C. vulgaris* Schrad., native of Africa, is a favorite fruit in Panama as well as elsewhere in Central America. In some regions of Central America excellent fruits of large size are grown, but in other localities the fruits are small, globose, and of poor quality. There are numerous local varieties, differing in shape and in color of flesh and seeds. The seeds often germinate in waste ground where they have fallen by accident, but the plants in such places rarely if ever mature fruit.

6. CUCUMIS L.

The cucumber ("pepino"), *C. sativus* L., native of southern Asia, is grown in Panama. The Chinese gardeners grow some very unusual (at least for the United States) forms, which perhaps belong to other species. The cantaloupe or muskmelon ("melón"), *C. melo* L., a plant of Old World origin, also is cultivated.

7. SICANA Naud.

The only species, *S. odorifera* (Vell.) Naud., is a native of tropical South America, but is planted occasionally in Panama and elsewhere in Central America for ornament or as a curiosity. It is a large coarse vine with broad cordate lobed leaves, the wide yellow flowers solitary in the axils. The fruits are cylindric, smooth, 30 to 60 cm. long, red, and very fragrant. In some regions they are said to be used for making preserves. In Panama the plant is called "chila"; in Salvador "melón de olor."

8. PITTIERA Cogn.

A plant apparently referable to *P. longipedunculata* Cogn. has been collected on the Pacific slope and occurs elsewhere in Panama. It is a coarse vine with broad, cordate, nearly entire leaves and long-pediceled yellow solitary flowers. The oval gourdlike fruits are 5 to 6 cm. long, green with pale longitudinal stripes.

9. **CUCURBITA** L. SQUASH

In Panama, as elsewhere in Central America, there are cultivated for food several forms of *C. pepo* L., known locally as "sapuyo" or "calabazo." In other parts of Central America these squashes are usually called "ayotes." The plants are often found escaped in waste places, but probably do not reseed themselves. Pumpkins such as those grown in the United States, the (presumably) typical form of *C. pepo*, are rarely if ever grown in Central America.

Pumpkins and squashes are supposed to be natives of America, but they are not known in a truly wild state.

10. **MELOTHRIA** L.

Leaves deeply 3 or 5-lobed; fruits 4 to 5 cm. long, mottled with light and dark green.......................................1. **M. trilobata** Cogn.
Leaves angulate or very shallowly lobed; fruits usually 1.5 to 2.5 cm. long, green or at maturity black.
  Anthers oblong, the connective narrow..2. **M. guadalupensis** (Spreng.) Cogn.
  Anthers orbicular, the connective broad..........3. **M. fluminensis** Gardn.

TheMelothrias are slender or coarse vines with rough leaves, the very small flowers yellow, the staminate in racemes or cymes, the pistillate usually solitary.

M. trilobata is common in brushy places. The large hard fruits are very handsome, shining and beautifully marbled in contrasting shades of green. *M. guadalupensis* also is a common species, a very slender vine. Its fruits resemble a small watermelon and are soft and pulpy, with the odor of cucumber. The Barbadians eat the fruits, which they call "wild cucumbers." In some parts of Panama the plant is called "sandillita."

M. fluminensis is reported by Cogniaux from the Canal Zone, but all the specimens from Panama seen by the writer and in condition for examination of the stamens seem to belong rather to *M. guadalupensis.*

11. **ANGURIA** L.

Anguria warscewiczii Hook, f., frequent in moist woods and thickets, is a slender glabrous vine with pedately 3-foliolate leaves, the terminal leaflet entire or sinuate, the lateral ones usually deeply 2-lobed. The flowers, slightly over 1 cm. long, are borne in long-peduncled spikes, and have a green tubular calyx and bright red petals.

12. **GURANIA** Cogn.

Stems woody; calyx obscurely puberulent or glabrate...1. **G. suberosa Standl.**
Stems herbaceous; calyx villous or hirsute.
  Leaves pedately 3-foliolate..........................2. **G. coccinea Cogn.**
  Leaves simple but lobed.
    Connective of the anthers broad..................3. **G. levyana Cogn**
    Connective narrow.........................4. **G. seemanniana Cogn.**

The Guranias are easily recognized in the family by their red calyces and hairy foliage.

G. suberosa, an endemic species of the Atlantic forests, is a large vine growing over tall trees, the stems woody and covered with thick ridged corky bark. The flowers are borne in racemes on the naked stems. The leaves have not been collected.

G. coccinea also is endemic here on the Atlantic coast. Its orange-red flowers are 1 cm. long, in a small corymb at the end of a long peduncle. The local name is "bien-te-veo." The country people are careful to keep at a distance from the plant for they state that one of the large caterpillars, whose hairs cause intense irritation of the skin and painful swelling, feeds on the leaves of it and other species. The long hairs on the leaves of some species are themselves irritant. Such is the popular fear of the plant that on one occasion a guide, an experienced woodsman, remonstrated vehemently, with every indication of deep alarm, when I was taking specimens of one of the species.

G. levyana occurs in the Atlantic forests, and *G. seemanniana* on both slopes. The latter is said to be called "bejuco picador."

13. **CAYAPONIA** Manso

Corolla 15 mm. long; fruit 6-seeded.................. 1. **C. poeppigii** Cogn.
Corolla 2 to 5 mm. long; fruit 2 or 3-seeded.
  Leaves decurrent at base upon the petiole; fruit oval.
    2. **C. racemosa** (Swartz) Cogn.
  Leaves not decurrent; fruit globose................. 3. **C. micrantha** Cogn.

At least one other species is known from Panama. The plants are coarse vines with rough, mostly lobed leaves, and the small flowers greenish white or yellowish green and racemose or solitary. The small fruits (1 to 1.5 cm. long) are globose or oval, few-seeded, and indehiscent.

C. poeppigii is of frequent occurrence in thickets. The leaves are larger than in the other species, often 25 cm. wide. *C. racemosa* is occasional on the Pacific slope. In Salvador it is known as "sandía de culebra," "hierba coral," "cámara," and "taranta." It is there reputed poisonous, especially to cattle. The fruit at maturity is orange or red. *C. micrantha* is common, at least on the Pacific watershed. Its fruit is bright red at maturity.

14. **CYCLANTHERA** Schrad.

Cyclanthera pedata Schrad. is occasional in thickets near the Pacific, a slender, nearly glabrous vine with 5-parted leaves and small white or cream flowers. The fruits are obliquely ovoid, 2.5 to 3 cm. long, and covered with slender soft spines. *C. naudiniana* Cogn., a closely related (if distinct) species, was reported from the region by Cogniaux.

15. **ELATERIUM** Jacq.

Leaves ciliate in the basal sinus with long white hairs... 1. **E. ciliatum** Cogn.
Leaves glabrate in the basal sinus, never long-ciliate.. 2. **E. longiflorum** Cogn.

One other species is known from Panama. The plants are slender vines with angled or shallowly lobed leaves, the upper ones often nearly sessile. The staminate flowers are racemose, yellow, the calyx tube slender and 2 to 3 cm. long. The fruit is oblique-ovoid, 3 to 4 cm. long, covered with soft green spines, and rupturing elastically at maturity.

E. ciliatum has been collected on the Pacific slope and elsewhere in Panama, but it is doubtful whether the Panama forms referred here are distinct from *E. longiflorum*, in spite of the conspicuous ciliation of the leaves. In Panama this plant is called "gallotillo" and "ñorbo cimarrón"; in Costa Rica "chanchito"; in Salvador "cochinito" or "cuchinito." In some regions the young fruits are cooked and eaten as a vegetable, and in Salvador the young tender branches also are eaten.

E. longiflorum is an endemic species, common in thickets. The starlike yellow flowers are rather pretty. The plant is sometimes called "sandía."

16. **SICYDIUM** Schlecht.

Sicydium tamnifolium (H. B. K.) Cogn. is a common plant in thickets, a slender vine with minute soft pubescence and broad cordate leaves, which are entire or nearly so. The minute, greenish yellow flowers form large lax panicles. The globose 1-seeded fruits, 6 mm. in diameter, are black at maturity.

17. **CHAYOTA** Jacq. CHAYOTE

The single species, *C. edulis* Jacq., is cultivated to some extent in Panama, and abundantly in many parts of Central America. Although an American plant, it is scarcely known wild. It is a large herbaceous vine, usually grown on trellises or poles, the leaves slightly rough, broadly cordate, and entire or angled. The pale green staminate flowers are arranged in long racemes; the pistillate are solitary. The fruit is somewhat pear-shaped, 7 to 20 cm. long, green to nearly white, smooth or rough, often covered with long soft spines. It contains a single large seed. A later name for the plant is *Sechium edule* Swartz.

The fruits are much eaten in Central America, being one of the most common vegetables of the region. They are usually boiled, and in flavor (when cooked) much resemble cucumbers. The young shoots also are used as a vegetable. The large tuberous roots (called "raíz" in Costa Rica, and "chinta" or "chintla" in Salvador) also are boiled and eaten, and delicious *dulces* are prepared from them. Every part of the plant can serve as food at one time or another.

In Panama the plant is called "chayote," a name in use in Costa Rica, Mexico, and other regions. Salvadorean and Guatemalan names are "güisquil," "güisayote," "huisquil," and "huisayote."

18. **SICYOS** L.

Sicyos polyacanthus Cogn. is reported from the region by Cogniaux, but has not been found recently. It is a large vine with broad, angled or lobed leaves. The staminate flowers are small and in long racemes, the pistillate capitate at the end of the peduncle. The hard spiny fruit is 1 cm. long.

141. LOBELIACEAE. Lobelia Family

Corolla white, the lobes nearly equal, less than half as long as the slender tube; leaves deeply and irregularly toothed.................. 1. **ISOTOMA.**

Corolla red or blue, the lobes very unequal; leaves shallowly dentate or entire.
  Corolla tube cleft to the base on one side; flowers red or blue; fruit capsular. 2. **LOBELIA.**
  Corolla tube not cleft; flowers red; fruit baccate........ 3. **CENTROPOGON.**

The genus *Burmeistera*, and perhaps others, is represented in Panama. The Lobeliaceae are large or small herbs with milky sap. The leaves are simple and alternate, without stipules, the perfect, mostly irregular flowers small or large, usually axillary. The calyx is adnate to the ovary, the lobes commonly 5, the corolla gamopetalous, with slender or thick tube, the limb 5-lobate or 2-lipped. The (usually 5) stamens have their anthers connate about the style.

1. **ISOTOMA** Lindl.

The only Central American species, *I. longiflora* (L.) Presl, occasional on the Pacific slope, is a coarse, somewhat pubescent herb, the leaves sessile or nearly so, oblanceolate, and coarsely toothed. The showy axillary short-pediceled white flowers are 10 cm. long or larger, the fruit a capsule. In Salvador the plant is called "jazmín del diablo" and "San Carlos"; in Yucatán "pensamiento."

2. LOBELIA L. LOBELIA

Corolla red, about 3 cm. long ---- 1. **L. splendens** Willd.

Corolla blue, about 3 mm. long.

Pedicels several times as long as the flowers; ovary almost wholly superior. 2. **L. ruderalis** Willd.

Pedicels mostly shorter than the flowers; ovary almost wholly inferior. 3. **L. fastigiata** H. B. K.

The Lobelias are herbs with bracted racemes of flowers. *L. splendens* is occasional on the Pacific slope, growing at the edge of streams. It is much like the cardinalflower (*L. cardinalis*) of the United States, a glabrous herb with narrow, almost linear leaves, and dense racemes of showy, bright red flowers. In some parts of Panama it is known as "flor de garza."

L. ruderalis has been collected at Pacora, and probably grows nearer the zone. It is a slender annual with ovate toothed leaves. *L. fastigiata* has been collected in wet fields near Juan Díaz, but appears to be rare. It is a small glabrous herb with lanceolate leaves.

3. CENTROPOGON Presl

Corolla glabrous, curved; leaves nearly entire ---- 1. **C. surinamensis** (L.) Presl.

Corolla puberulent, nearly straight; leaves closely and sharply serrate. 2. **C. coccineus** (Hook.) Wimmer.

The plants are large succulent herbs with short-petioled, oblong or lanceolate, nearly glabrous leaves. The large (5 to 6 cm. long) showy red flowers, with 2-lipped corolla, are long-pediceled.

C. surinamensis is frequent in wet woods or thickets on the Atlantic slope. It is often clambering, with stems 3 meters long. The flowers are rose or pale red and handsome. *C. coccineus* has been collected at Alhajuela.

142. ASTERACEAE. Aster Family[18]

A. Leaves all alternate, or sometimes all basal.

Leaves all basal, or the stems merely bracted.

Stem scapose, bearing a single head; leaves white-tomentose beneath. **50. CHAPTALIA.**

Stem bearing several heads; leaves not tomentose ---- **4. ORTHOPAPPUS.**

Leaves not all basal, the stems leafy.

Rays present, broad, yellow, orange, or white.

Rays white; leaves deeply lobed ---- **32. VERBESINA.**

Rays yellow or orange; leaves not lobed.

Plants woody ---- **51. TRIXIS.**

Plants herbaceous.

Plants scandent; pappus of soft bristles ---- **48. SENECIO.**

Plants not scandent; pappus none or of 2 awns.

Flowers all radiate; pappus of numerous bristles. **52. HIERACIUM.**

Flowers of the disk not radiate; pappus none or of 2 awns.

Pappus of 2 awns; plants tall, erect; lower leaves 3-lobed.

cf. also Viguiera, lvs. not lobed **29. TITHONIA.**

Pappus none; plants low, procumbent; leaves not lobed. **39. CHRYSANTHELLUM.**

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[18] The writer is under obligations to Dr. S. F. Blake for assistance in the preparation of the account of this family.

Rays none or (in *Erigeron*) filiform and inconspicuous.

Pappus a crown of broad scales.

Flower heads clustered in secondary heads or glomerules; leaves white-tomentose beneath.

Phyllaries 2; pappus a persistent toothed crown...7. **ROLANDRA.**

Phyllaries 5; pappus of distinct deciduous scales. 8. **SPIRACANTHA.**

Flower heads not clustered in secondary heads or glomerules; leaves not white-tomentose.

Heads many-flowered, lavender..................1. **STRUCHIUM.**

Heads 4 or 5-flowered, green..................35. **GARCILASSA.**

Pappus of few or many bristles.

Flowers yellow, greenish yellow, or orange.

Plants woody; leaves white-tomentose beneath...49. **LYCOSERIS.**

Plants herbaceous; leaves not white-tomentose.

Leaves mostly palmately 3-lobed; plants usually a meter high or larger..............................45. **NEUROLAENA.**

Leaves not lobed, or sometimes pinnately several-lobed; plants usually low.

Heads about 1.5 cm. long; principal phyllaries in a single series, with a few short ones at base..........46. **ERECHTITES.**

Heads much less than 1 cm. long; phyllaries all equal or nearly so.

Heads with inconspicuous rays; leaves entire or toothed. 13. **ERIGERON.**

Heads discoid; leaves lyrate-lobed.............14. **CONYZA.**

Flowers white, pink, purple, red, or bronze.

Phyllaries and leaves furnished with large glands. A glabrous annual with bronze flowers.............42. **POROPHYLLUM.**

Phyllaries and leaves without glands.

Leaves entire; dioecious shrubs with white flowers. 15. **BACCHARIS.**

Leaves, at least most of them, toothed or lobed; plants not dioecious; herbs except in *Vernonia*.

Phyllaries equal, in a single series...............47. **EMILIA.**

Phyllaries unequal, in 2 or more series.

Flower heads clustered in secondary heads or glomerules. Herbs with white or purple flowers.

Pappus bristles all alike, straight....5. **ELEPHANTOPUS.**

Pappus bristles dissimilar, 2 of them longer and bent near the apex..............6. **PSEUDELEPHANTOPUS.**

Flower heads not clustered in secondary heads.

Pappus of few deciduous bristles. Annual with purple heads......................2. **CENTRATHERUM.**

Pappus of persistent bristles.

Pappus bristles unequal, the outer ones short. Shrubs or herbs, not growing in water......3. **VERNONIA.**

Pappus bristles all of equal length. Large herb, growing usually in shallow water...........16. **PLUCHEA.**

AA. **Leaves**, except sometimes the uppermost, opposite.

Phyllaries or leaves, or both, with conspicuous oil glands. Annuals; flowers yellow, bronze, or brown; pappus of bristles or scales.

Heads discoid, the flowers bronze. Leaves undulate. 42. **POROPHYLLUM.**

Heads radiate, the flowers yellow.
Leaves pinnately parted------------------------------------43. **TAGETES.**
Leaves linear, entire--------------------------------------44. **PECTIS.**
Phyllaries and leaves without conspicuous oil glands.
Pappus of numerous bristles, of plumose bristle-like scales, or of 5 awned scales.
Heads radiate. A small herb with pale yellowish flowers; pappus of plumose bristle-like scales---------------------------41. **TRIDAX.**
Heads discoid.
Pappus of 5 awned scales. Annual with lavender flowers.
9. **AGERATUM.**
Pappus of slender bristles.
Plants scandent; phyllaries 4----------------------11. **MIKANIA.**
Plants not scandent; phyllaries more than 5.
Achenes 5-angled. Herbs or shrubs with white or purple flowers.
10. **EUPATORIUM.**
Achenes 10-striate. Annual with greenish flowers. Brickellia
12. **COLEOSANTHUS.**
Pappus none or a low crown, of 1 to 4 awns or short bristles, or of scales without awns.
Phyllaries 4, the 2 outer ones rounded-cordate and bractlike, rounded at apex. Herbs-----------------------------------17. **ELVIRA.**
Phyllaries usually more than 4, not cordate.
Fruit covered with hooked prickles. Herb.
22. **ACANTHOSPERMUM.**
Fruit without hooked prickles.
Plants woody shrubs.
Flowers white. Pappus none---------------19. **CLIBADIUM.**
Flowers yellow.
Pappus none; fruit somewhat fleshy at maturity. Heads radiate----------------------------------26. **WULFFIA.**
Pappus of scales or awns; fruit dry.
Pappus of 2 awns; heads discoid; plants subscandent.
34. **SALMEA.**
Pappus of scarious linear scales; heads radiate or discoid; plants erect-------------------------------40. **CALEA.**
Plants herbaceous, but sometimes very large.
Leaves pinnately several-lobed, or once or twice pinnatisect.
Heads of 2 kinds, staminate, and pistillate, without rays; achenes without pappus, tuberculate------------23. **AMBROSIA.**
Heads all alike; achenes not tuberculate, the pappus of 2 to 4 awns.
Phyllaries all similar, imbricate in several series. Very large herb; heads white, radiate------------32. **VERBESINA.**
Phyllaries in 2 series, the inner and outer very unlike.
Rays large, orange, pink, purple, or white--37. **COSMOS.**
Rays small, white or pale yellow, or none--38. **BIDENS.**
Leaves merely toothed or entire, or palmately 3-lobate.
Pappus none or a mere crown, or of scales, never of awns or spine-like teeth, sometimes of 2 or 3 short bristles.
Heads discoid or with whitish rays.
Heads 4 or 5-flowered. Heads discoid, greenish.
35. **GARCILASSA**

Heads many-flowered.
Receptacle flat or concave; rays present, small. **25. ECLIPTA.**
Receptacle conic or convex; rays present or absent.
Pappus crownlike, sometimes with 2 or 3 short bristles; rays none, the flowers bright yellow; plants densely pubescent.......... **28. ELEUTHERANTHERA.**
Pappus of 2 or 3 bristles, or none; rays present or absent, the flowers whitish; plants nearly glabrous. **33. SPILANTHES.**

Heads with yellow rays.
Receptacle not paleaceous. Heads with 5 or fewer flowers, only one of them with a ray.......... **18. MILLERIA.**
Receptacle not paleaceous.
Disk flowers sterile, only the ray flowers fertile.
Achenes not inclosed in the subtending phyllaries; pappus a cuplike crown; involucre not biseriate. **20. BALTIMORA.**
Achenes inclosed in the subtending phyllaries; pappus none; involucre biseriate..**21. MELAMPODIUM.**
Disk flowers fertile.................... **27. WEDELIA.**

Pappus of 2 to 4 smooth or barbed awns (awns sometimes deciduous), or of 2 spinelike teeth.
Rays none; disk white................ **30. MELANTHERA.**
Rays present; disk yellow.
Rays red or purple; leaves entire........... **24. ZINNIA.**
Rays yellow; leaves toothed or lobed.
Achenes with 2 spinelike teeth at apex; heads sessile. **36. SYNEDRELLA.**
Achenes with pappus of 2 slender awns; heads long-stalked.
Achenes 4-angled; lower leaves 3-lobed. **29. TITHONIA.**
Achenes strongly compressed; lower leaves not lobed. **31. SIMSIA.**

The name Compositae is often used for this family. A few other genera are known from Panama. The plants are herbs or shrubs, sometimes scandent, with alternate or opposite leaves. The flowers are arranged in heads, surrounded by an involucre of bracts, called phyllaries. The flowers are generally of two kinds: disk flowers, on the center of the receptacle, usually hermaphrodite; and marginal or ray flowers, usually pistillate or sterile, about the margin of the receptacle. The ray flowers, if present, have a strap-shaped corolla; the disk flowers usually have a tubular corolla. The anthers are connate into a tube. The ovary is inferior, the fruit an achene. The calyx is represented commonly by variously modified pappus at the summit of the achene. A discoid head is one without ray flowers.

1. STRUCHIUM P. Br.

The single species, *S. sparganophorum* (L.) Kuntze (*Sparganophorus vaillantii* Crantz), is common in swamps and wet fields. It is a nearly glabrous, probably perennial herb, 30 to 60 cm. high, with alternate, petiolate, oblanceolate to elliptic, serrate or subentire leaves. The many-flowered, greenish or lavender heads, 4 to 5 mm. high, are sessile and clustered in the leaf axils. The achenes are 3 or 4-angled, glabrous or glandular, the pappus a shallowly lobed or entire, cartilaginous crown.

2. CENTRATHERUM Cass.

Centratherum punctatum Cass. grows on the Pacific slope in grassy places, but is rare. It is an erect annual, more or less villous, with alternate, petioled, lanceolate, serrulate or entire leaves. The flowers are purple, the heads over 1 cm. broad, on long naked peduncles, the outer bracts large, green, and leaflike, the inner membranous or scarious and appressed. The achenes are 8 or 10-ribbed, the pappus of caduous bristles.

3. VERNONIA Schreb.

Achenes terete; plant a small herb..................... **1. V. cinerea** (L.) Less.
Achenes 10-ribbed; shrubs.
  Leaves scaberulous beneath; bracts villous-ciliate; branches of the panicle short and stiff, bearing few heads................ **2. V. patens** H. B. K.
  Leaves densely whitish-pilose beneath; bracts villous with ascending hairs; branches of the panicle long, slender, usually recurved and bearing numerous heads............................. **3. V. canescens** H. B. K.

Probably other species exist in Panama. The Vernonias have alternate, short-petioled, oblong to ovate leaves, entire or nearly so, and white or purple heads, sessile along the scorpioid panicle branches. The heads in our species are small (about 5 mm. high) and many-flowered, with small, closely imbricate bracts. The pappus consists of 2 series, the outer of short scales or bristles, the inner of long bristles.

V. cinerea, a common weed about the zone, is a native of the Old World tropics but has become naturalized in tropical America. The flowers are purple. *V. patens*, common in brushy places, is a shrub of 1 to 3 meters with fragrant white flowers. In Panama it is called "lengua de vaca," "botón de pega-pega," "salvia," and "lengua de buey"; in Costa Rica "tuete"; in Salvador "suquinay," "suquinayo," "palo blanco," and "pie de zope."

V. canescens also is a common shrub. The branches are usually long and arching or reclining, the flowers pink or white. The plant is said to be known here as "hierba de San Juan."

The United States species of *Vernonia* are known as "ironweed," but they are very different in aspect from the tropical ones.

4. ORTHOPAPPUS Gleason

The single species, *O. angustifolius* (Swartz) Gleason, grows in the savannas near Panama and in the grassland of Ancón Hill. It is a perennial herb with a cluster of basal leaves which are narrowly oblanceolate, obtuse, nearly entire, and thinly pubescent. The narrow 4-flowered lavender heads (1 cm. long) are borne in sessile clusters along the simple or few-branched stems. The achenes are 10-striate, with pappus of bristles.

5. ELEPHANTOPUS L.

Elephantopus mollis H. B. K., common in brushy places, is an erect, probably perennial herb with alternate, oblong or obovate, crenate, soft-pubescent leaves, most of which are borne near the base of the stem. The flowers are white or purple, the heads small, narrow, with 5 or fewer flowers, arranged in globose bracted heads at the ends of the few branches. The achenes are 10-ribbed, pubescent, the pappus of few bristles which are dilated at base.

6. **PSEUDELEPHANTOPUS** Rohr

The single species, *P. spicatus* (Juss.) Rohr (*Distreptus spicatus* Cass.), is a common weed, and one of the most abundant Central American plants. It is a coarse herb, usually 30 to 60 cm. high, with leafy stems, the leaves alternate, elliptic or obovate, dilated and clasping at base, entire or nearly so, and nearly glabrous. The flowers are pale purple, the heads 4-flowered, in small dense clusters forming long spikes. The achenes are 10-striate, the pappus of 10 to 15 bristles. In Panama the plant is called "escobilla blanca" and "chicoria"; in Costa Rica "escoba real"; in Salvador "escoba," "amor seco," "oreja de coyote," and "oreja de chucho"; in Mexico "oreja de sapo" and "oreja de burro." The plant is used in domestic medicine, and coarse brushes or brooms for sweeping are often made from it by the country people. In Panama a sirup made from the plant is employed as a remedy for coughs.

7. **ROLANDRA** Rottb.

Only one species is known, *R. fruticosa* (L.) Kuntze, common about the zone. It is a coarse herb, often a meter high or more, with alternate, oblong or elliptic, entire leaves, green above and white-tomentose beneath. The flowers are white, the heads 1-flowered, with 2 narrow scales which are tipped with a spinelike bristle. The heads are crowded in dense sessile collective heads along the branches. The achenes are 4 or 5-angled, the pappus a short, irregularly toothed crown.

8. **SPIRACANTHA** H. B. K.

The only Central American species, *S. cornifolia* H. B. K., is frequent on the Pacific slope. It is a coarse erect herb, a meter high or less, with alternate, ovate, nearly entire leaves, green above and white-tomentose beneath. The flowers are purple, the heads 1-flowered, collected in small dense clusters subtended by leafy bracts, each head subtended by a spine-tipped bract. The involucre is formed of 5 or 6 phyllaries. The achenes are slightly compressed and obscurely 5-nerved, with pappus of numerous unequal scales.

9. **AGERATUM** L. AGERATUM

Ageratum conyzoides L. is occasional as a weed, a villous erect annual with opposite, petioled, ovate or deltoid, crenate leaves. The lavender discoid heads, about 5 mm. long, are arranged in small corymbs. The phyllaries are thin, ribbed, subequal, in 2 or 3 series, the achenes 5-angled, with pappus of 5 awned scales. Some species of the genus are grown for ornament. In Salvador this species is known as "mejorana."

10. **EUPATORIUM** L.

Leaves sessile, sometimes with narrow but margined, petiolelike bases.
  Leaves coriaceous, obtuse, glabrous or nearly so, usually with broad bases; heads corymbose..........................1. **E. amygdalinum** Lam.
  Leaves thin, acuminate, finely pubescent beneath, at least the upper ones with petiolelike bases; heads in large lax panicles..2. **E. elatum** Steetz.
Leaves conspicuously petiolate.
  Heads cylindric.
    Heads corymbose, 10 to 12 mm. high................3. **E. odoratum** L.
    Heads in small glomerules in open forking panicles, about 5 mm. high. 4. **E. iresinoides** H. B. K.

Heads campanulate or turbinate.
  Heads 10 to 12 mm. high; phyllaries broad, glandular; leaves oblong-ovate. **5. E. vitalbae** DC.
  Heads 3 to 8 mm. high; phyllaries narrow, not glandular; leaves mostly broadly ovate or deltoid-ovate.
    Receptacle hairy, convex; heads 6 to 8 mm. high. **6. E. macrophyllum** L.
    Receptacle glabrous, flat; heads 3 to 5 mm. high.
      Heads fully 5 mm. high, short-pediceled, in narrow cymes. **7. E. microstemon** Cass.
      Heads about 3 mm. high, long-pediceled, in broad lax panicles. **8. E. sinclairii** Benth.

Other species are known from Panama. The plants are herbs or shrubs with mostly opposite, toothed leaves, and small or large discoid heads of white, purple, or pink flowers. The phyllaries are imbricate in 2 or more series, the achenes 5-angled, with pappus of slender bristles.

E. amygdalinum grows in the Pacific savannas and in the grassland of Ancón Hill and Taboga. It is a stiff perennial herb, nearly glabrous, with oblong leaves and heads (6 mm. high) of bright pink flowers. On Taboga it is said to be called "colindre." *E. elatum* has been collected on the Atlantic slope, but not recently.

E. odoratum is very common. It is a large herb or shrub, usually with long clambering branches. The leaves are rhombic-ovate or deltoid and coarsely toothed. The corymbs of lavender or occasionally white heads are showy. The plant is known here as "paleca," and "hierba de chiva." The West Indians call it "Christmas-bush," and employ a tea made from the leaves as a remedy for colds.

E. iresinoides, known here only from Taboga Island, is a large slender herb with greenish white flowers. *E. vitalbae*, occasional in thickets of the Pacific slope, is a woody vine, or sometimes erect, with many showy, pink or purple heads. The leaves are thick and lustrous. *E. macrophyllum* is a common plant in thickets of the Atlantic slope. It is an unattractive species, a coarse herb, 1 to 2.5 meters high, with dense cymes of greenish white heads.

E. microstemon, a small annual with purple flowers, grows on the Atlantic slope, but is scarce. *E. sinclairii* is a common weedy annual with small, pale purple heads.

11. MIKANIA Willd.

Heads spicate, the spikes panicled .... **1. M. leiostachya** Benth.
Heads in cymes or corymbs, often pediceled.
  Leaves decurrent at base upon the petiole ...... **2. M. guaco** Humb. & Bonpl.
  Leaves cordate at base, not decurrent.
    Heads 10 mm. high .... **3. M. cordifolia** Willd.
    Heads 5 to 6 mm. high .... **4. M. micrantha** H. B. K.

The Mikanias are vines, usually herbaceous, sometimes suffrutescent, with opposite, petioled, toothed or entire leaves, and small heads of white flowers. The heads are 4-flowered, the involucre of 4 narrow bracts, the achenes 5-angled, with pappus of numerous bristles.

M. leiostachya is occasional in thickets, a large vine with ovate or broader, entire, acuminate leaves. *M. guaco* grows in the same region, and *M. cordifolia* occurs on both slopes. *M. micrantha* is common in thickets. Its flowers are very fragrant, with the odor of vanilla. The leaves and stems of *M. guaco* are employed in Panama as a remedy for snake bites, and the remedy is reputed to be an efficient one.

12. COLEOSANTHUS Cass.

Coleosanthus diffusus (Vahl) Kuntze (*Brickellia diffusa* A. Gray), occasional in brushy places on the Pacific slope, is a large slender glabrate annual with opposite, petioled, broadly deltoid-ovate, crenate leaves. The numerous small (7 mm. long) discoid heads of greenish white flowers form large lax panicles. The achenes are 10-striate, with pappus of slender white bristles.

13. ERIGERON L.

Stem leaves spatulate or obovate, coarsely crenate.....1. **E. spatulatus** Vahl.
Stem leaves mostly linear, serrate or entire...............2. **E. bonariensis** L.

At least one other species occurs in Panama. Ours are coarse, weedy, hairy annuals with alternate leaves which are sessile or on margined petioles. The small (4 to 5 mm. high), greenish white heads are loosely panicled, the ray flowers with small and inconspicuous rays, the involucre of numerous linear, slightly unequal phyllaries. The achenes are compressed, with pappus of slender tawny bristles.

Both species are common weeds about the zone. *E. bonariensis* is known here as "tabaquillo."

14. CONYZA L.

Conyza lyrata H. B. K., an occasional weed in waste places on the Pacific slope, is a coarse annual, villous-pilose and viscid, with alternate, obovate, toothed and lyrate-lobed leaves. The greenish white, discoid heads, 7 mm. high, are in broad panicles, the phyllaries linear, unequal, in several series. The achenes are compressed, with pappus of white bristles. The plant exhales a strong offensive odor. In some parts of Panama it is called "lechuguilla"; in Salvador "talilla."

15. BACCHARIS L.

Baccharis trinervis (Lam.) Pers. is frequent in thickets. It is a shrub, erect or with long, arching, reclining, or scandent branches, the leaves alternate, short-petioled, lance-oblong, 3-nerved, entire, and glabrate. The small (6 to 7 mm. long), discoid, greenish white heads are dioecious, in compact rounded corymbs at the ends of the branches. The achenes are 10-nerved, with pappus of many dirty-white bristles. In Panama the name "Santa María" is said to be applied to the shrub. In Costa Rica it is called "Santo Domingo"; in Salvador "tapabarranca" and "guarda-barranca"; in Guatemala "barba fina." The flowers are usually sweet-scented.

Another species, *B. splendens* Heering, occurs in Chiriquí.

16. PLUCHEA Cass.

A plant of this genus, probably *P. purpurascens* (Swartz) DC., has been observed growing in the edge of Gatún Lake, but specimens have not been collected, consequently the determination is slightly doubtful. It is a coarse, pubescent, somewhat viscid herb with small purple heads in corymbose cymes.

17. ELVIRA Cass.

The only Central American species, *E. biflora* (L.) Cass., is a common weed in waste places. It is a slender erect annual with opposite, lanceolate or ovate, serrate or nearly entire, rugose, strigose leaves. The small heads are clustered in the axils or at the ends of the branches. The phyllaries are 2 to 4, green, the outer ones cordate-orbicular. The heads consist of 1 fertile ray flower and 1 or 2 sterile disk flowers. The achenes are obovate, compressed, and without pappus.

18. MILLERIA L.

The single species, *M. quinqueflora* L., is a frequent weed in brushy places. It is a viscid annual, much branched, with opposite, broadly ovate, toothed leaves on winged petioles. The small (about 5 mm. long) yellow heads are arranged in loose slender panicles. The involucre, which is accrescent in fruit, is subglobose, formed of a broad concave green phyllary and of several smaller ones. There is 1 fertile ray flower and 4 or fewer sterile disk flowers. The achene is obovate, compressed, glabrous, without pappus. In Mexico the plant is called "pericón."

19. CLIBADIUM L.

Pubescence of branches closely appressed; heads with 9 to 11 pistillate flowers.
1. **C. caudatum** Blake.
Pubescence of the branches of spreading or ascending hairs; heads with 3 to 6 pistillate flowers.............................. 2. **C. surinamense** L.

Clibadium caudatum is an endemic species whose type was collected near Bohío. *C. surinamense* L. is common in woods and thickets, an erect shrub of 1 to 2.5 meters, the leaves opposite, ovate-oblong, short-petioled, crenate, and densely rough-pubescent. The small (5 mm. long) white subglobose heads are arranged in small terminal corymbs, the involucre of few broad, rounded, thin, closely imbricate phyllaries. The outer flowers are fertile, the inner sterile. The achenes are rounded-obovoid, compressed, without pappus. The vernacular names "mastranzo de monte" and "zalagueña" are reported from Panama, and the plant is said to be employed as a remedy for erysipelas.

One or more additional species are known from Panama.

20. BALTIMORA L.

The single species, *B. recta* L., is common in fields and thickets, a large erect branched annual with opposite, slender-petioled, broadly ovate, crenate, rough-pubescent leaves. The heads are 5 mm. high, the campanulate involucre of few broad acuminate strigose bracts. The rays are bright yellow and showy, the ray flowers fertile, the disk flowers sterile, the receptacle paleaceous. The achenes are thick, 3-angled, usually glabrous, tuberculate or smooth, the pappus a short dentate cuplike crown. In Salvador the plant is called "flor amarilla"; in Guatemala "mirasol."

21. MELAMPODIUM L.

Rays conspicuous, longer than the involucre; leaves acute to long-decurrent at base; plant glabrous...................... 1. **M. divaricatum** (Rich.) DC.
Rays shorter than the involucre; leaves rounded at base; plant hairy.
2. **M. camphoratum** (L. f.) Baker.

Melampodium divaricatum (Rich.) DC., a common weed in fields and thickets, is an erect branched scabrous annual with mostly rhombic-ovate, inconspicuously toothed leaves, narrowed to winged petioles. The yellow heads are nearly 1 cm. broad, with short rays, the involucre biseriate, the 4 or 5 outer bracts broad and green, the inner closely investing the ray flowers. The receptacle is paleaceous, the ray flowers fertile, those of the disk sterile. The achenes are broad, compressed, greenish, coarsely reticulate on the sides, without pappus.

This is one of the most abundant weeds of Central America. In Panama it is called "sirvulaca" and "botón de oro"; in Salvador "flor amarilla" and "hierba del sapo"; in Mexico "margarita," "hierba amarilla," and "canutillo."

M. camphoratum is rare here, and has been collected only on the Pacific slope.

22. ACANTHOSPERMUM Schrank

Acanthospermum humile (Swartz) DC. has been collected on both slopes, but has not been found recently about the zone. It is a much-branched pubescent annual with small, opposite, broadly ovate, irregularly toothed leaves. The small heads are sessile or nearly so, solitary in the axils, the 5 phyllaries oval. The flowers are yellow, the ray flowers 5 to 7. The fruit is furnished with hooked prickles.

23. AMBROSIA L. RAGWEED

Ambrosia cumanensis H. B. K. has been collected on the Atlantic slope, but seems to be rare. It is much like the ragweed of the United States, an erect pubescent annual with alternate and opposite, bipinnatifid leaves. The small discoid heads are unisexual and monoecious, the involucre green and gamophyllous. The thick hard achenes bear a few short spinelike tubercles.

24. ZINNIA L. ZINNIA

The common garden zinnia (known also as "youth-and-old-age"), *Z. elegans* Jacq., is planted commonly for ornament. It is a native of Mexico, an annual with opposite leaves and large showy heads (often double), with rays mostly in shades of red and purple. The names given to the plant in Panama are "margarita" and "girasol." In Salvador it is called "cambray."

25. ECLIPTA L.

The only North American species, *E. alba* (L.) Hassk., is common about the zone, and is one of the abundant weeds of Central America. It is an erect or prostrate, strigose herb with opposite, linear to oblong-lanceolate, inconspicuously toothed leaves. The small (6 to 9 mm. broad) heads are borne on short peduncles, solitary or in pairs, in the axils and at the ends of the branches. The involucre has about 2 series of subequal green bracts. The rays are very small and whitish. The achenes are angled or compressed, glabrous, the pappus a low denticulate crown.

26. WULFFIA Neck.

The only Central American species, *W. baccata* (L. f.) Kuntze, has been collected in forests of the Atlantic slope. It is an arching shrub with opposite, short-petioled, ovate or oblong-ovate, crenate or nearly entire, rough leaves. The flowers are yellow, the heads about 2 cm. broad, with small rays, the involucre of 2 or 3 series of subequal green bracts. The achenes are 4-angled or somewhat compressed, without pappus, at maturity somewhat fleshy.

27. WEDELIA Jacq.

Stems usually rooting at the lower nodes, often procumbent; leaves nearly sessile, cuneate at base, often shallowly 3-lobed, not or scarcely scabrous; achenes conic at apex........................**1. W. trilobata** (L.) Hitchc.

Stems erect, never rooting; leaves slender-petioled, obtuse or rounded at base, not lobed, very scabrous; achenes truncate.

  Involucre 8 to 10 mm. high........................**2. W. jacquini** L. Rich.

  Involucre about 6 mm. high........................**3. W. parviceps** Blake.

The Wedelias are annual or perennial herbs with opposite toothed leaves. The radiate yellow heads are long-peduncled and solitary in the axils or at the ends of the branches, their involucres of somewhat biseriate phyllaries, the outer of which are green and foliaceous. The achenes are oblong or obovate, laterally compressed or those of the rays 3-angled, the pappus cuplike and dentate or of distinct scales.

W. trilobata is common in moist soil on the Atlantic slope, and grows on Taboga. Sometimes the stems become long and more or less scandent. The leaves are rather fleshy. In Panama this species is sometimes called "clavellín de playa."

W. jacquini is common, especially on the Pacific slope, a coarse herb, sometimes 2.5 meters high. It is called "pasarín" on Taboga. *W. parviceps* has been collected in the savannas near Panama.

28. ELEUTHERANTHERA Poit.

The genus consists of a single species, *E. ruderalis* (Swartz) Schultz Bip., occasional here. It is an unattractive pubescent annual with opposite, petioled, mostly ovate, shallowly toothed leaves. The flowers are yellow, in very small discoid heads nearly sessile in the forks of the branches and in the upper axils. The 5 to 10 phyllaries are unequal, the outer herbaceous. The achenes are obovate-oblong, obscurely 2 or 3-angled, pubescent and muricate, the pappus a dentate crown, sometimes with 2 or 3 short bristles.

29. TITHONIA Desf.

Tithonia rotundifolia (Mill.) Blake has been found here only on Taboga Island, where it is plentiful. It is a somewhat pubescent herb, a meter high, suggesting a sunflower. The leaves are ovate or broader, sometimes 3-lobed, on margined petioles. The heads are 2.5 cm. broad or more, with showy yellow rays, the involucre of numerous broad phyllaries. The achenes are angled, the pappus of 2 awns and a toothed crownlike border. In Salvador the plant is known as "acate," "jalacate," "chilicacate," "árcabo," and "baraboja," and a decoction of the leaves is administered as a remedy for malaria.

30. MELANTHERA Rohr

Leaves mostly narrowly or broadly deltoid and 5 to 8 cm. long or larger; heads over 1 cm. broad........................1. **M. aspera** (Jacq.) L. Rich.
Leaves mostly linear-oblong and 2 to 3 cm. long; heads less than 1 cm. broad.
2. **M. microphylla** Steetz.

Melanthera aspera is common nearly everywhere about the zone, a coarse rough herb, 1 to 2.5 meters high, with opposite, petioled, crenate, mostly ovate leaves, which are often hastate-lobed. The discoid white heads, about 1 cm. broad, are borne on long peduncles in the axils or at the ends of the branches. The involucre consists of 2 or 3 series of unequal ovate phyllaries. The achenes are compressed-tetragonous, the pappus of deciduous awns; the pales of the disk are green. The anthers are black and conspicuous in contrast with the white corollas. The local names are "julio," "clavellina de monte," and "sirvulaca." The plant is said to afford good forage for cattle, especially milch cows.

M. microphylla is an endemic species, known only from the savannas beyond Panama City. It is a much smaller plant, its branches usually prostrate.

31. SIMSIA Pers.

Simsia grandiflora Benth. is abundant on the Pacific slope, in the region of Bella Vista forming dense thickets. It is a coarse annual herb, often 3 meters high, with opposite (below) and alternate, petioled, broadly cordate, crenate, velvety-pubescent leaves. The yellow heads, with short rays, are 2 cm. broad or larger, on long peduncles at the ends of the branches. The involucre consists of numerous narrow, nearly equal, hairy phyllaries. The achenes are compressed, with pappus of 2 awns. In Panama the plant is called "sirvulaca"; in Salvador "mirasol."

32. VERBESINA L.

Verbesina myriocephala Schultz Bip. is common in brushy places, often forming dense stands. It is a coarse herb, usually simple-stemmed, 1.5 to 3 meters high. The leaves (at least the upper) are alternate, very large, narrowed to petiole-like clasping bases, soft-pubescent beneath, pinnatifid into narrow toothed lobes. The small (about 7 mm. high) white heads, with inconspicuous rays, form large terminal corymbs. The achenes are compressed, broadly winged, and bear 2 stiff awns at apex. The local names are "cerbatana" and "lengua de buey." In Salvador the plant is called "chimaliote negro."

33. SPILANTHES Jacq.

Heads about 6 mm. long; rays present; phyllaries oval, very obtuse.
1. **S. uliginosa** Swartz.
Heads 8 to 10 mm. long or larger; rays usually none; phyllaries ovate or oblong, often acutish......................2. **S. ocymifolia** (Lam.) A. H. Moore.

The plants are weedy annuals, erect or decumbent, with opposite, petioled, toothed or entire, nearly glabrous leaves. The heads are either discoid or with very small rays, on long peduncles, the flowers yellowish green or whitish. The phyllaries are small, subequal, and closely imbricate, the receptacle convex or elongate, the disk thus ovoid. The achenes are triquetrous or compressed, ciliate, the pappus of 2 or 3 bristles or wanting.

S. uliginosa has been collected on the Atlantic slope.

S. ocymifolia is a common weed, its local name "sirvulaca." In Salvador it is called "hierba de la rabia" and "duerme-boca." It is said that the roots, when chewed, deaden sensation in the tongue, and that they are chewed as a remedy for toothache, but it may be that these properties are ascribed because of confusion of the plant with *Salmea scandens*.

34. SALMEA DC.

Salmea scandens (L.) DC. has been collected on the Atlantic slope. It is a scandent, nearly glabrous shrub, with opposite, petioled, mostly ovate, serrate or entire leaves. The flowers are dirty-white, the discoid heads 1 cm. long or smaller, in terminal corymbs. The receptacle is conic, the involucre of few broad, unequal, closely appressed phyllaries. The achenes are compressed and ciliate, the pappus of 2 awns.

In Salvador the plant is known as "duerme-boca." This name is given because it is affirmed that when the leaves are chewed, sensation in the mouth is lost temporarily. The shrub is known in the same country also as "salta-afuera." It is employed as a fish poison, and is said to be very effective, hence the name.

35. GARCILASSA Poepp. & Endl.

The genus consists of a single species, *G. rivularis* Poepp. & Endl., which has been found near Frijoles. It is an erect annual, thinly scabrous-pubescent, with alternate, petioled, ovate or lanceolate, serrate, 3-nerved leaves. The small green heads are clustered in the axils and at the ends of the branches. They are 4 or 5-flowered and discoid, the few phyllaries unequal and green. The achenes are oblong, laterally compressed, the pappus a ciliolate ring.

36. SYNEDRELLA Gaertn.

Synedrella nodiflora (L.) Gaertn., the only Central American species, is a common weed here. It is an erect annual, strigose-pubescent, with opposite, petioled, chiefly ovate, shallowly toothed leaves and small sessile heads of yellow flowers clustered in the axils or in the forks of the branches. The rays are small and inconspicuous, the involucre of few narrow phyllaries, of which the outer 1 or 2 are usually herbaceous. The ray achenes are compressed and winged, with 2 stiff spines at the apex.

37. COSMOS Cav.

Rays deep pink or dull red........................1. **C. caudatus** H. B. K

Rays orange..2. **C. sulphureus** Cav.

The plants are erect annuals, glabrous or nearly so, with opposite leaves pinnatisect into numerous narrow segments. The heads, with large showy rays, are borne on long slender peduncles; the involucre is 2-seriate. The achenes are slender and 5-angled, attenuate into a slender beak, and bear at the apex 2 to 4 barbed awns.

C. caudatus, occasional in brushy places, is known here as "clavellina" and in Salvador as "mozote doradilla" and "cambray montés." *C. sulphureus*, sometimes planted as an ornamental, and also naturalized, is a handsome and showy plant, a native of Mexico. In Panama it is called "niño muerto," and by the West Indians "sunflower." In Salvador it is known as "flor de muerto" and "botón de oro," in Mexico as "zumpoal" and "San Miguel."

The common garden cosmos, *C. bipinnatus* Cav., a native of Mexico, with showy pink or white rays, perhaps is grown in Panama.

38. BIDENS L.

Leaves bipinnately dissected.....................1. **B. cynapiifolia** H. B. K.

Leaves pinnately dissected (the lower pinnae rarely pinnatisect)..2. **B. pilosa** L.

At least one other species occurs in Panama. Our species are weedy annual herbs, pubescent or nearly glabrous, with opposite parted leaves. The heads are small (about 6 mm. high in flower, much larger in fruit), on slender peduncles. The involucre is biseriate, the outer phyllaries often herbaceous. The achenes are long and slender, angled, sometimes attenuate at apex, and terminated by 2 to 4 barbed awns.

B. cynapiifolia is of infrequent occurrence. *B. pilosa* is a common weed about the zone, known as "arponcito," "cadillo," and "sirvulaca." In other parts of Central America it is called usually "mozote" or "mozotillo." The West Indians know the plant as "Spanish-needles." The typical form of *B. pilosa* has discoid heads, but there is also a common form with small, white or yellowish rays, which is var. *radiata* Schultz Bip.

39. CHRYSANTHELLUM Rich.

Chrysanthellum integrifolium Steetz is frequent on the savannas near Panama and grows as a weed in lawns about Balboa. It is a small glabrous annual with alternate, oblong or spatulate, serrate, obtuse, somewhat fleshy leaves, and small (1 cm. broad or less) radiate heads on long peduncles. The broad phyllaries have scarious margins. The narrow achenes are striate, without pappus.

40. CALEA L.

Heads radiate; leaves usually coarsely serrate........**1. C. urticifolia** (Mill.) DC.
Heads discoid; leaves with few remote, low and inconspicuous serrations.
2. C. prunifolia H. B. K.

The Caleas are erect shrubs with petioled, chiefly ovate, rough leaves and small (1 cm. long or less) yellow heads, corymbose or umbellate in the axils and at the tips of the branches. The involucre is campanulate, the phyllaries obtuse, imbricate in several series. The achenes are 4 or 5-angulate, the pappus of scarious linear scales.

Both species are frequent in brushy places. They are conspicuous shrubs because of their numerous bright yellow heads. C. *urticifolia* is known in western Mexico as "tacote," and *C. prunifolia* is said to be called "escobilla" in Panama.

41. TRIDAX L.

Tridax procumbens L., common about the zone, is one of the most abundant of Central American weeds. It is a hairy annual, usually procumbent, with opposite, petioled, coarsely toothed leaves, and long-peduncled heads of pale yellow flowers, with very short rays. The campanulate involucre is composed of few slightly unequal, obtuse phyllaries, the outer ones herbaceous. The achenes are hairy, turbinate, the pappus of numerous plumose-ciliate bristle-like scales. In Salvador the plant is known commonly as "hierba del toro."

42. POROPHYLLUM Adans.

Porophyllum ruderale (Jacq.) Cass. is a frequent weed in fields and thickets, an erect glabrous branched annual, often a meter high, with alternate and opposite (below), slender-petioled, elliptic or oblong, sinuate leaves which bear numerous large glands on the margins and surface. The numerous discoid heads, 2.5 cm. long, are slender-peduncled, the flowers bronze. The cylindric involucre consists of 5 linear bracts. The achenes are linear, with pappus of numerous straw-colored bristles.

43. TAGETES L. MARIGOLD

The common Aztec marigold, *T. erecta* L., believed to be a native of Mexico, although probably not known in a truly wild state, is grown for ornament in Panama. It is a well-known plant, a glabrous strong-scented annual with opposite, pinnately parted leaves and large long-stalked heads of yellow flowers. Double-flowered forms are common. In Panama the plant is called "clavellina' and "amapola."

44. PECTIS L.

Pappus of numerous stiff bristles as long as the achene or longer; plants stiffly erect..**1. P. elongata** H. B. K.
Pappus of short broad scales, 1 mm. long or less; plants diffusely branched, usually decumbent................................**2. P. swartziana** Less.

Other species are known from Panama. Ours are slender strong-scented annuals, the leaves opposite, linear, bristly-ciliate toward the base. The small (about 7 mm. long) yellow few-flowered radiate heads are borne on slender peduncles. The achenes are linear, with persistent pappus.

P. elongata is common on the Pacific slope in grassland and on rocks along the coast, and *P. swartziana* is occasional in the same region. In Panama *P. elongata* is called "hierba de alacrán," and in Salvador "hierba del talepate."

Panama specimens determined by Rydberg as *P. capillaris* DC. do not seem to differ essentially from *P. elongata*.

45. NEUROLAENA R. Br.

Neurolaena lobata (L.) R. Br. is common in brushy places, a large coarse herb, 1 to 3 meters high. The leaves are alternate and short-petioled, rough-pubescent, the upper mostly oblong or lanceolate and serrate, the lower broad and deeply 3-lobed. The yellow discoid heads, about 7 mm. high, form large terminal corymbose panicles. The involucre consists of numerous thin unequal obtuse yellowish phyllaries. The achenes are oblong-turbinate, the pappus of numerous whitish bristles. In Panama the plant is called "contragavilana." It is claimed that the juice rubbed on the skin keeps off ticks, which if true, would make it a highly useful plant here. In Costa Rica and Salvador this species is known as "gavilana;" in Guatemala as "mano de lagarto," "tabaquillo," and "trespuntas;" in Mexico as "rabo de faisán" and "hierba amarga."

46. ERECHTITES Raf.

Erechtites hieracifolia (L.) Raf., frequent in brushy places, is a common tropical weed, and occurs over the eastern half of the United States. It is an erect, simple or branched, somewhat pubescent annual, with alternate, mostly lanceolate, coarsely toothed leaves, the upper sessile, the lower tapering to short petioles. The greenish discoid heads, 1.5 cm. high, are arranged in small corymbs. The involucre consists of a series of linear erect phyllaries, with a few much shorter ones at base. The short 10-striate achenes have pappus of numerous long soft white bristles. In Panama the plant is called "tabaquillo;" in Salvador "té del suelo." The English name is fireweed.

47. EMILIA Cass.

Phyllaries equaling the flowers; flowers pale purple or pink; stem leaves usually lyrate-lobed..**1. E. sonchifolia** (L.) DC.

Phyllaries shorter than the flowers; flowers dark red; stem leaves dentate or entire..**2. E. sagittata** (Vahl) DC.

The plants are pubescent or nearly glabrous, erect annuals, the leaves alternate, the upper with clasping bases. The discoid heads are 1 cm. high and laxly corymbose. The short slender achenes are 5-angled, with pappus of numerous soft white bristles.

E. sonchifolia is a common weed, probably native in the Old World tropics, but widely naturalized in tropical America. *E. sagittata*, which is sometimes planted for its rather handsome flowers, has been found as a weed at Balboa. It is a native of tropical Asia and Africa. In Salvador it is known as "pincel" and "pincel de la reina."

48. SENECIO L.

Senecio benthamii Griseb. has been collected on the Atlantic slope, but appears to be rare. It is a large herbaceous vine with alternate, petioled, oblong-deltoid, toothed, somewhat pubescent leaves, and few large (1.5 cm. long) heads with red or orange rays. The achenes are costate, the pappus of numerous soft white bristles. In Costa Rica the plant is called "San Rafael."

Other species are known from Panama.

49. LYCOSERIS Cass.

Phyllaries glabrous, ciliolate, the outer with reflexed or spreading tips.
1. L. crocata (Bertol.) Blake.

Phyllaries arachnoid-tomentose, closely appressed.....**2. L. oblongifolia** Rusby.

The plants are large, usually arching or reclining shrubs with alternate, short-petiolate, chiefly lance-oblong, triplinerved, entire leaves, green and glabrous above, densely white-tomentose beneath. The large (2 to 4 cm. long) dioecious campanulate heads are solitary at the ends of the branches, the flowers orange-yellow, the outer flowers radiate. The involucre is composed of numerous unequal narrow imbricate phyllaries. The achenes are 5-costate, glabrous, the pappus of numerous long whitish bristles.

Both species are frequent in thickets, *L. crocata* growing on the Atlantic slope, and *L. oblongifolia* chiefly on the Pacific watershed. They are showy shrubs because of their large and brightly colored heads.

50. **CHAPTALIA** Vent.

The only Central American species, *C. nutans* (L.) Polak., is common in brushy places and on open banks. It is a perennial herb with a basal rosette of leaves, these oblong or obovate, obtuse, mostly lyrate-lobed toward the base, green above and densely white-tomentose beneath. The large (2 to 3 cm. long) heads have short rays, varying from white to red-purple, and are borne on long naked tomentose scapes. The involucre is composed of numerous unequal, narrow, closely imbricate phyllaries. The achenes are fusiform, slender-beaked, with pappus of numerous long soft tawny bristles. In Salvador and Honduras the plant is called "valeriana." Oviedo reports this herb under the name "coygaraca," stating that it was employed as a remedy for wounds.

51. **TRIXIS** P. Br.

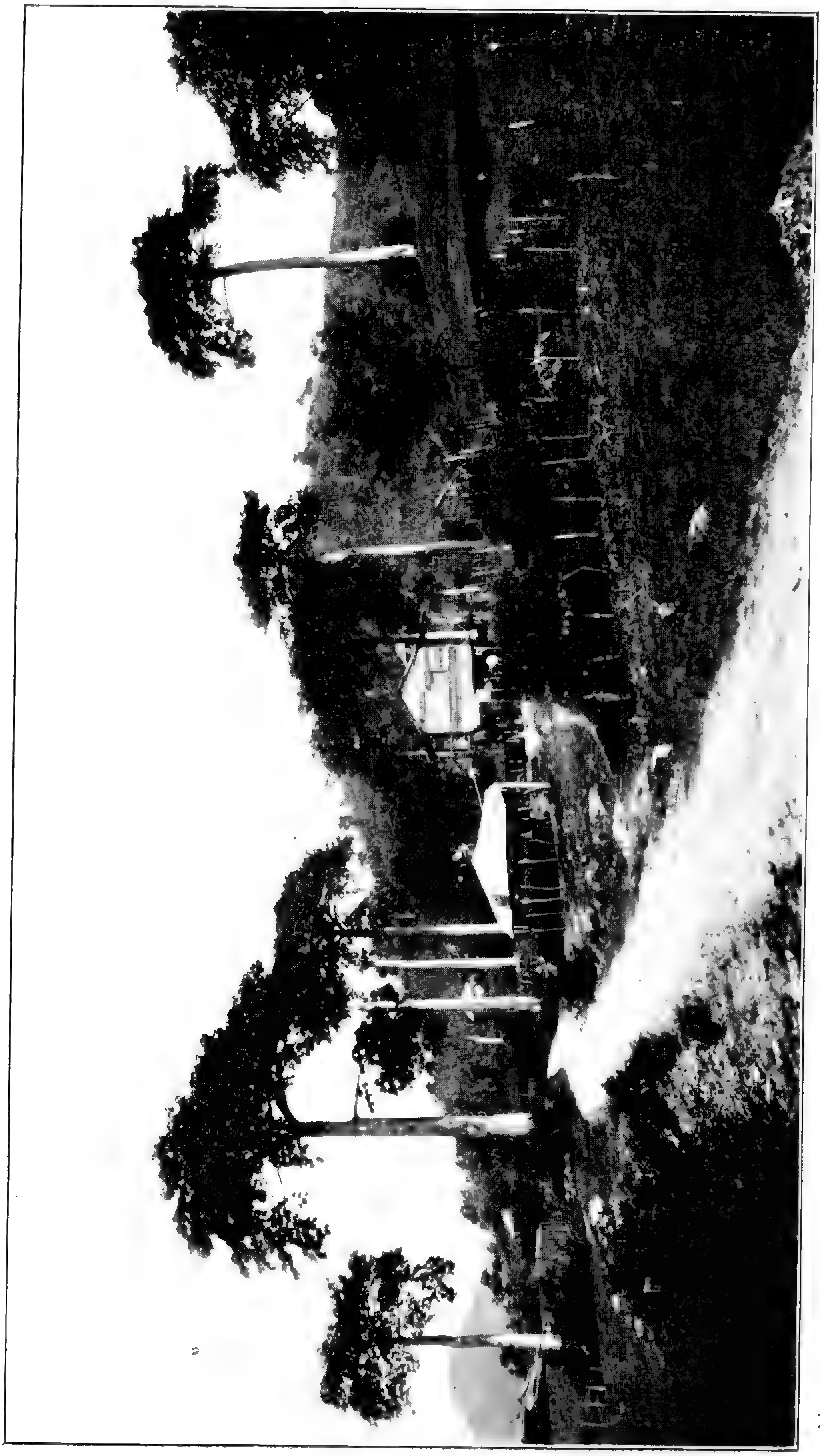
Trixix radialis (L.) Kuntze is common in thickets along the Pacific shore, an erect or clambering, somewhat pubescent or glabrate shrub with alternate, nearly sessile, chiefly lance-oblong, nearly or quite entire leaves. The heads, 1 cm. long or larger, with short yellow rays, are borne in small corymbs. The narrow involucre is composed of few unequal oblong-linear phyllaries. The slender achenes are pubescent, with pappus of numerous tawny bristles. In Salvador the shrub is called "San Pedro," "Santo Domingo," "Carmen," and "tulán verde."

52. **HIERACIUM** L. HAWKWEED

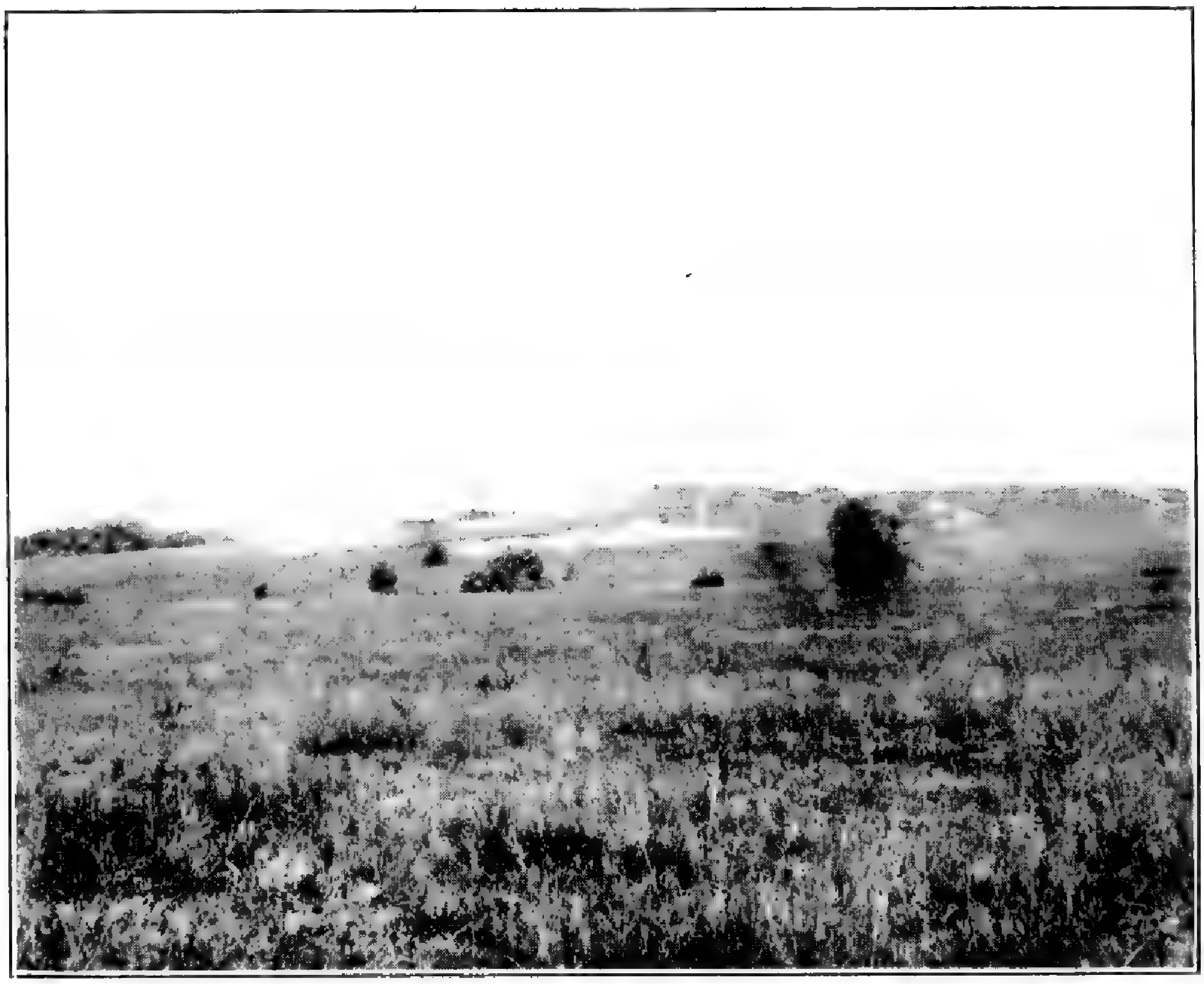
The only species known from this part of Panama, *H. panamense* Blake, is endemic about Alhajuela. It is a tall hairy herb with a basal rosette of obovate, nearly entire leaves. The yellow heads, 8 mm. high, are arranged in an open panicle, their phyllaries subequal and linear. The small glabrous achenes have a pappus of numerous bristles.

PLATES

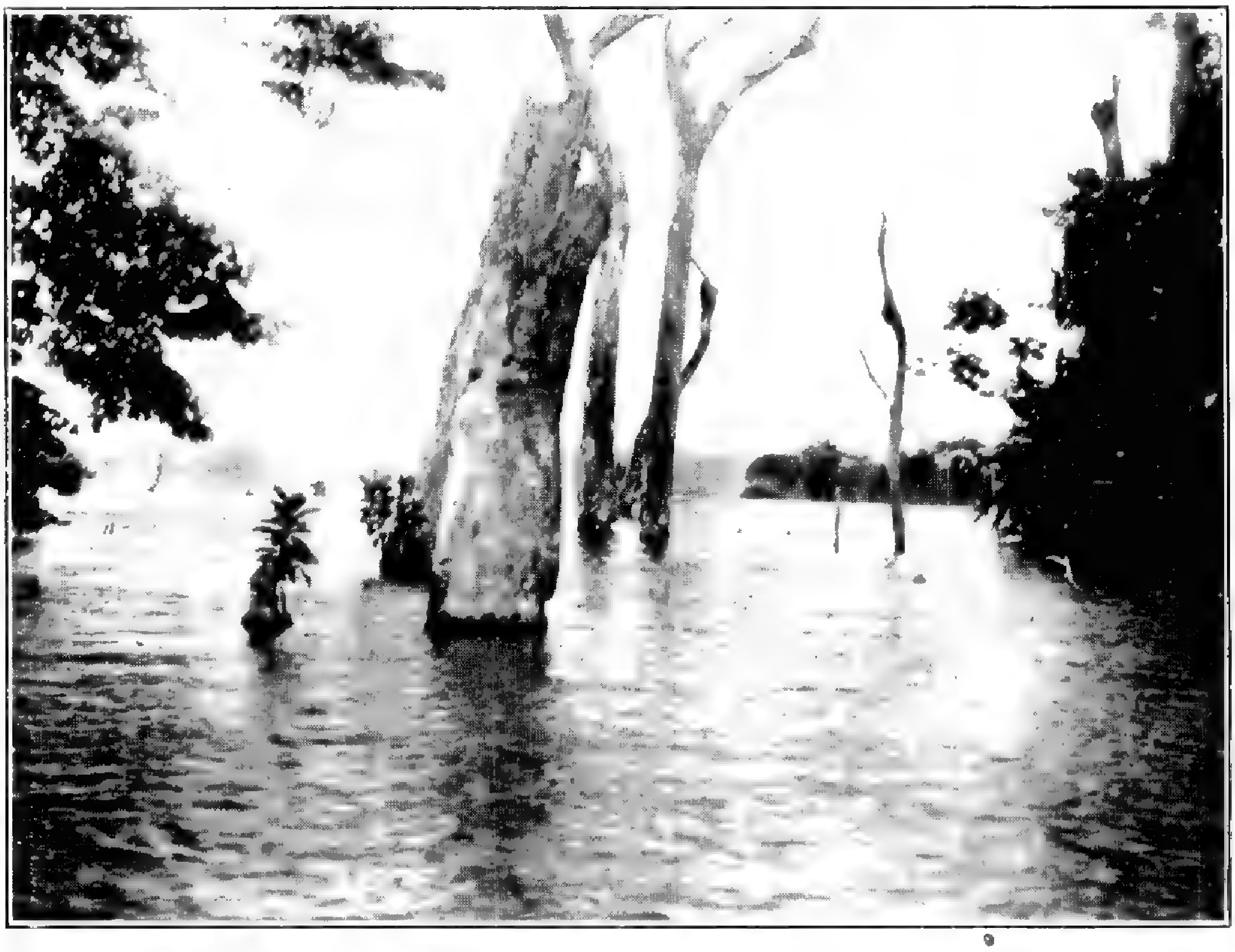
Plate 1



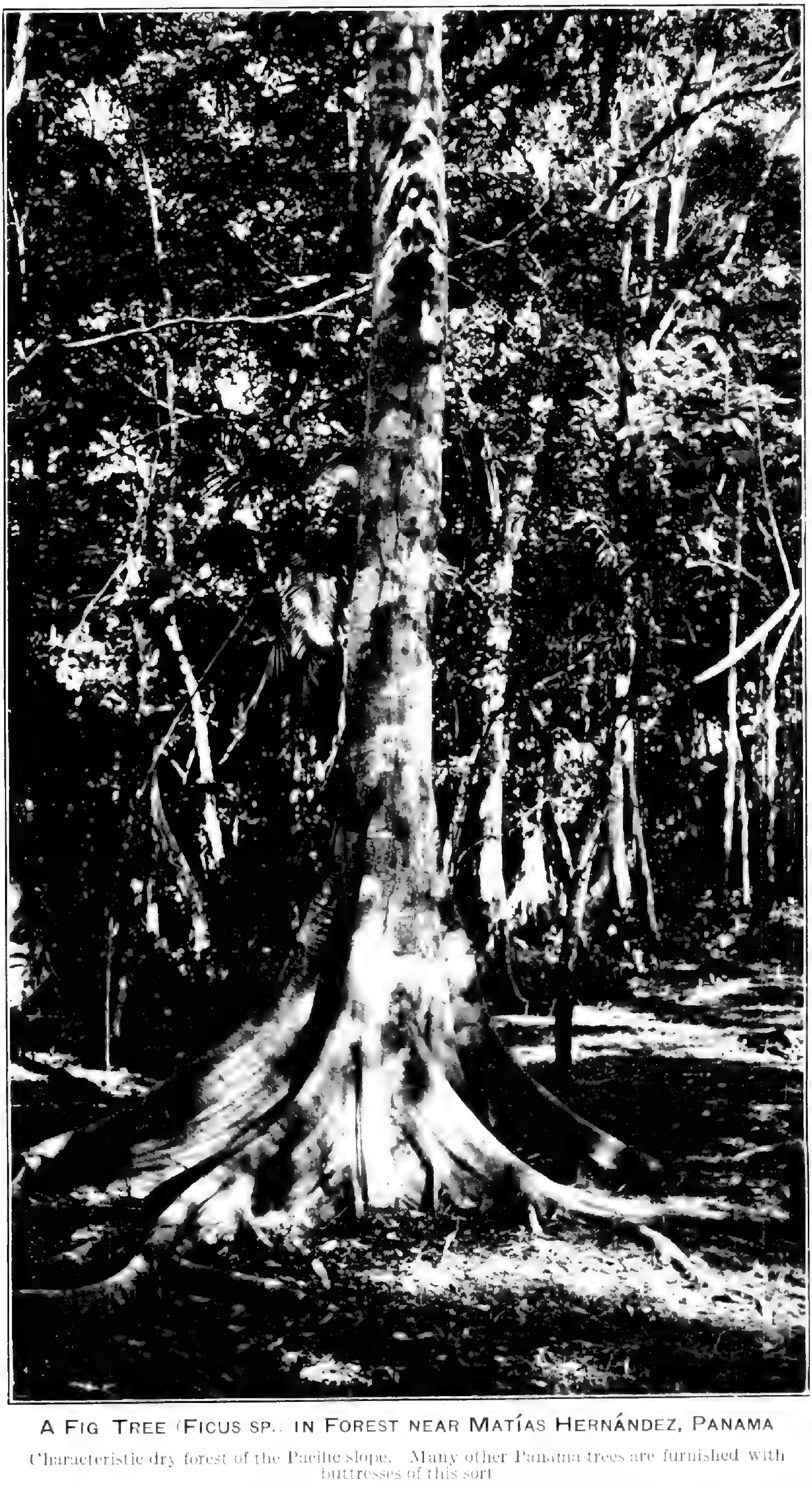
View near Pedro Miguel, Canal Zone, Typical of the Deforested Lands of the Pacific Slope. The Large Trees are Cuipos (Cavanillesia platanifolia)



A. VIEW ON THE SAVANNAS NEAR PANAMA CITY



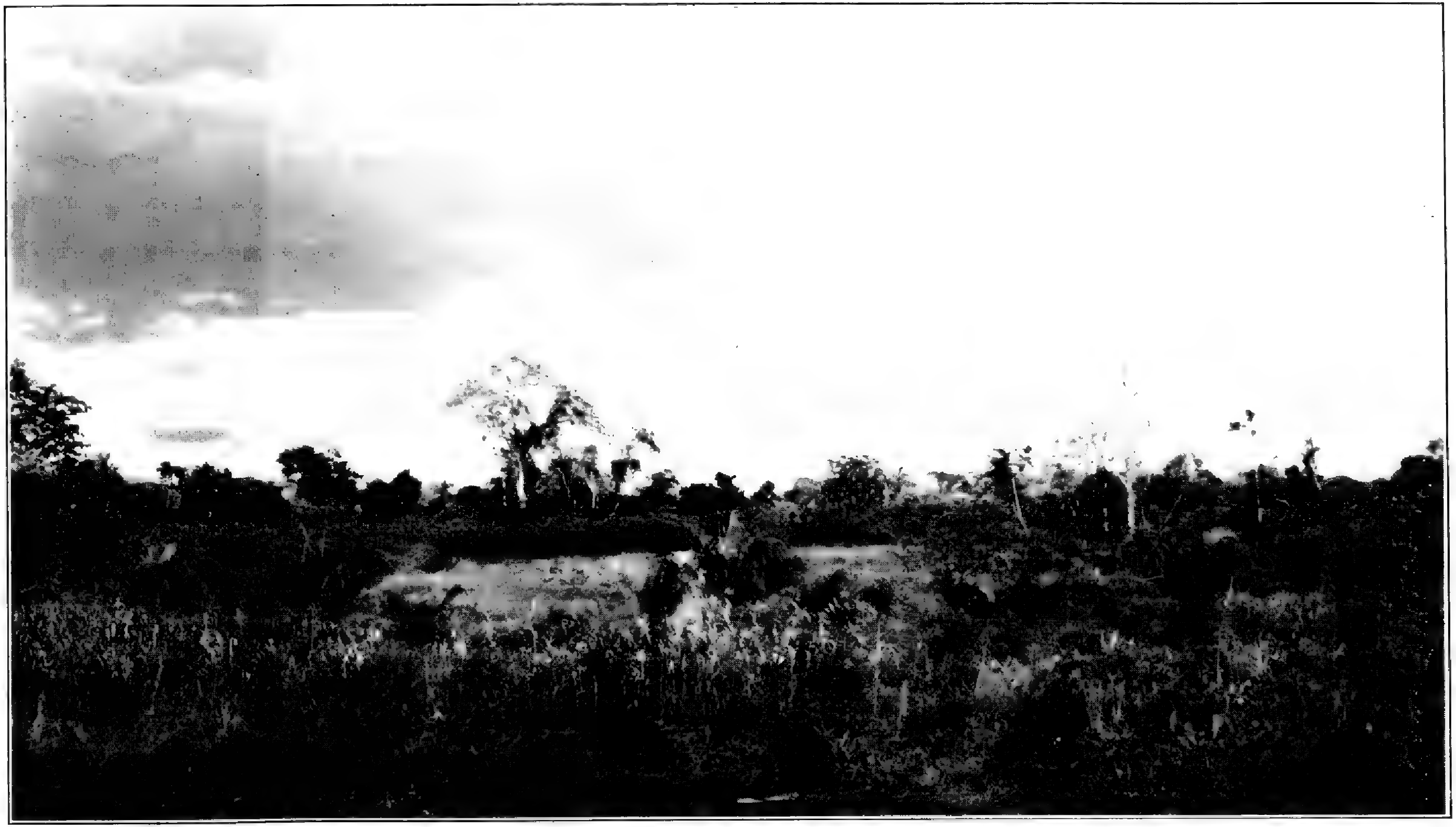
B. VIEW OF GATÚN LAKE FROM LABORATORY LANDING, BARRO COLORADO ISLAND. THE DEAD TREES, KILLED WHEN THE CHAGRES VALLEY WAS INUNDATED, ARE A CONSPICUOUS FEATURE OF GATÚN LAKE



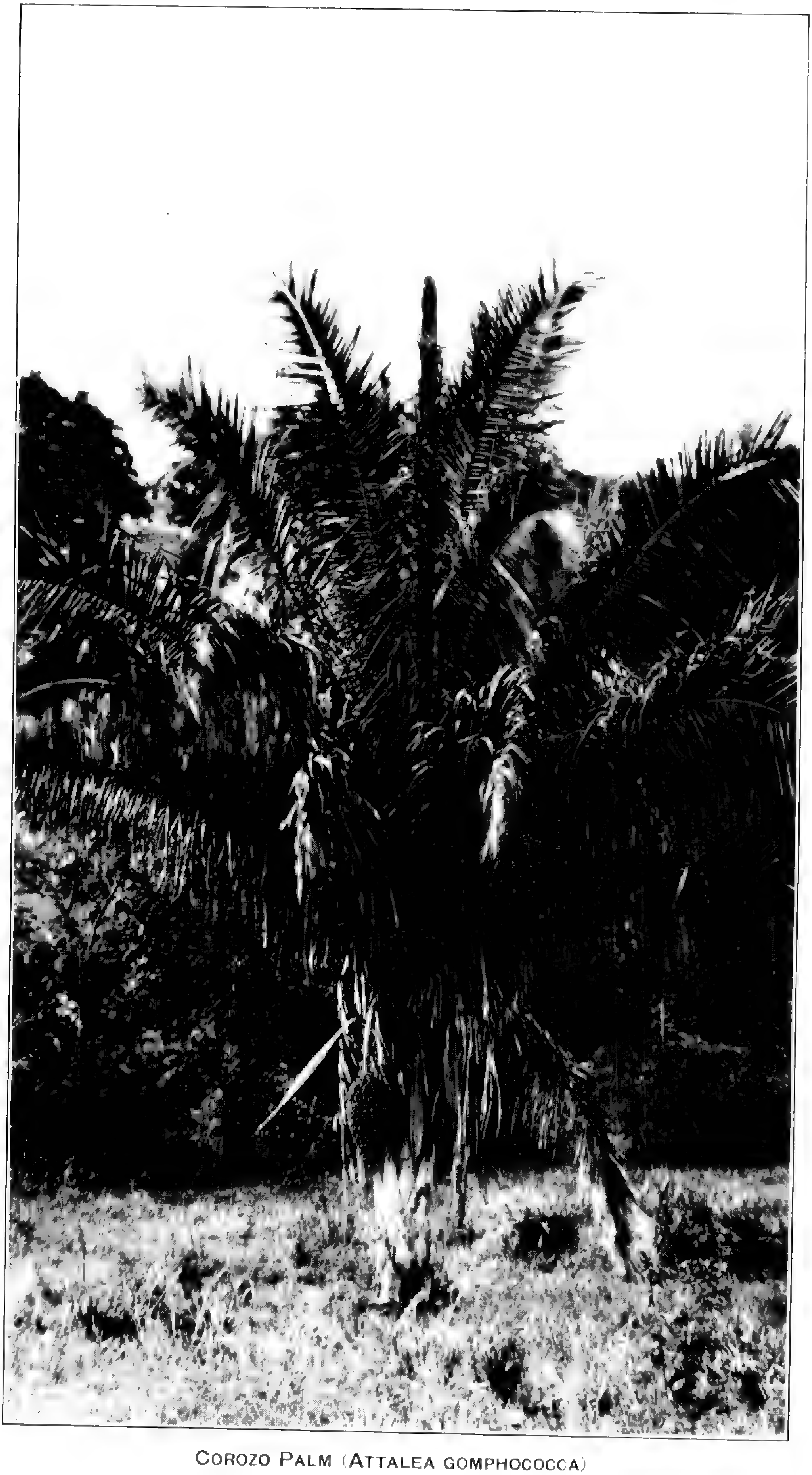
A FIG TREE (FICUS SP.) IN FOREST NEAR MATÍAS HERNÁNDEZ, PANAMA

Characteristic dry forest of the Pacific slope. Many other Panama trees are furnished with buttresses of this sort

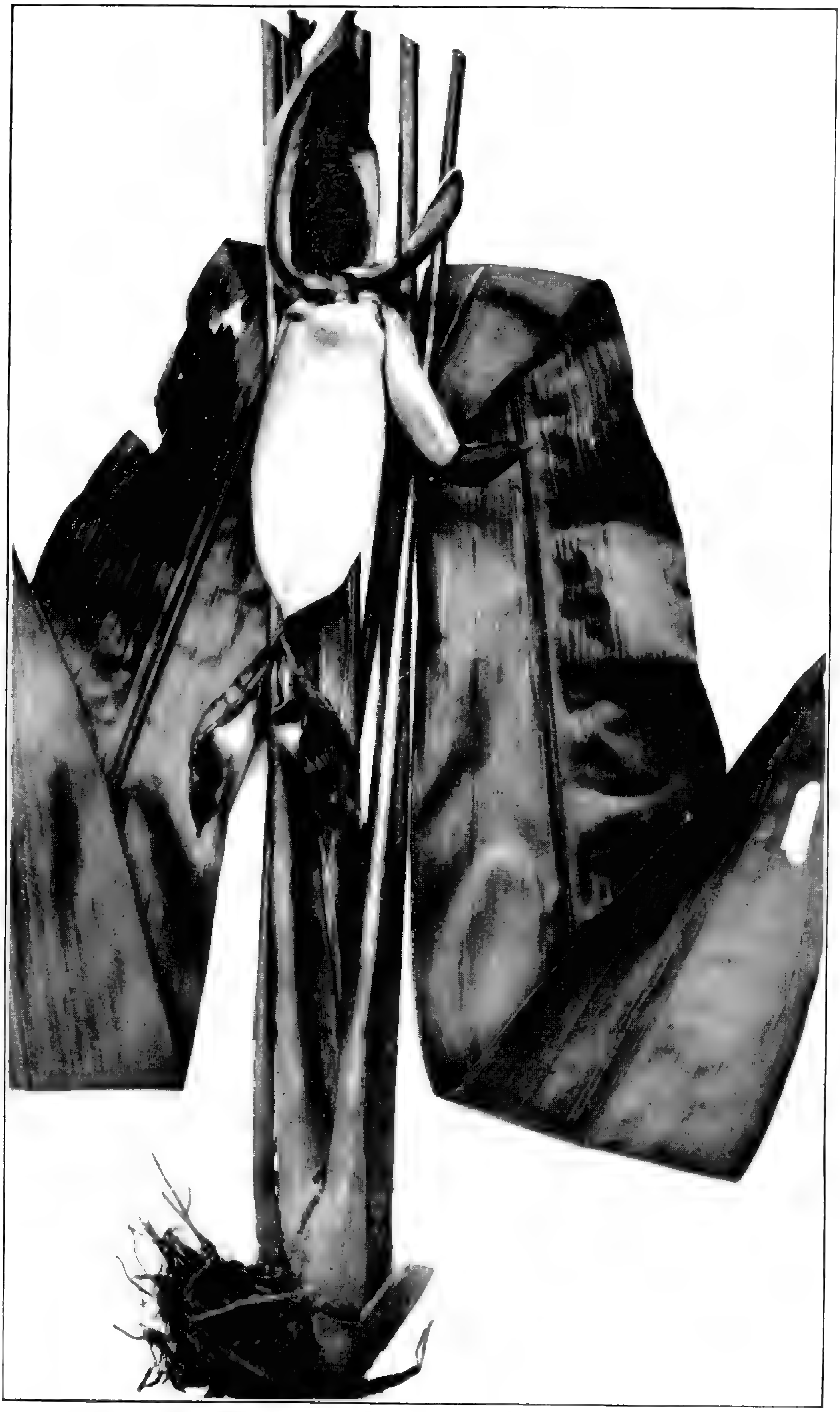
SECOND-GROWTH FOREST AT MATÍAS HERNÁNDEZ, PANAMA. THE LARGE-LEAVED HERBS ARE HELICONIAS



VIEW NEAR MATÍAS HERNÁNDEZ, PANAMA. A TYPICAL SWAMP LANDSCAPE OF THE PACIFIC SLOPE

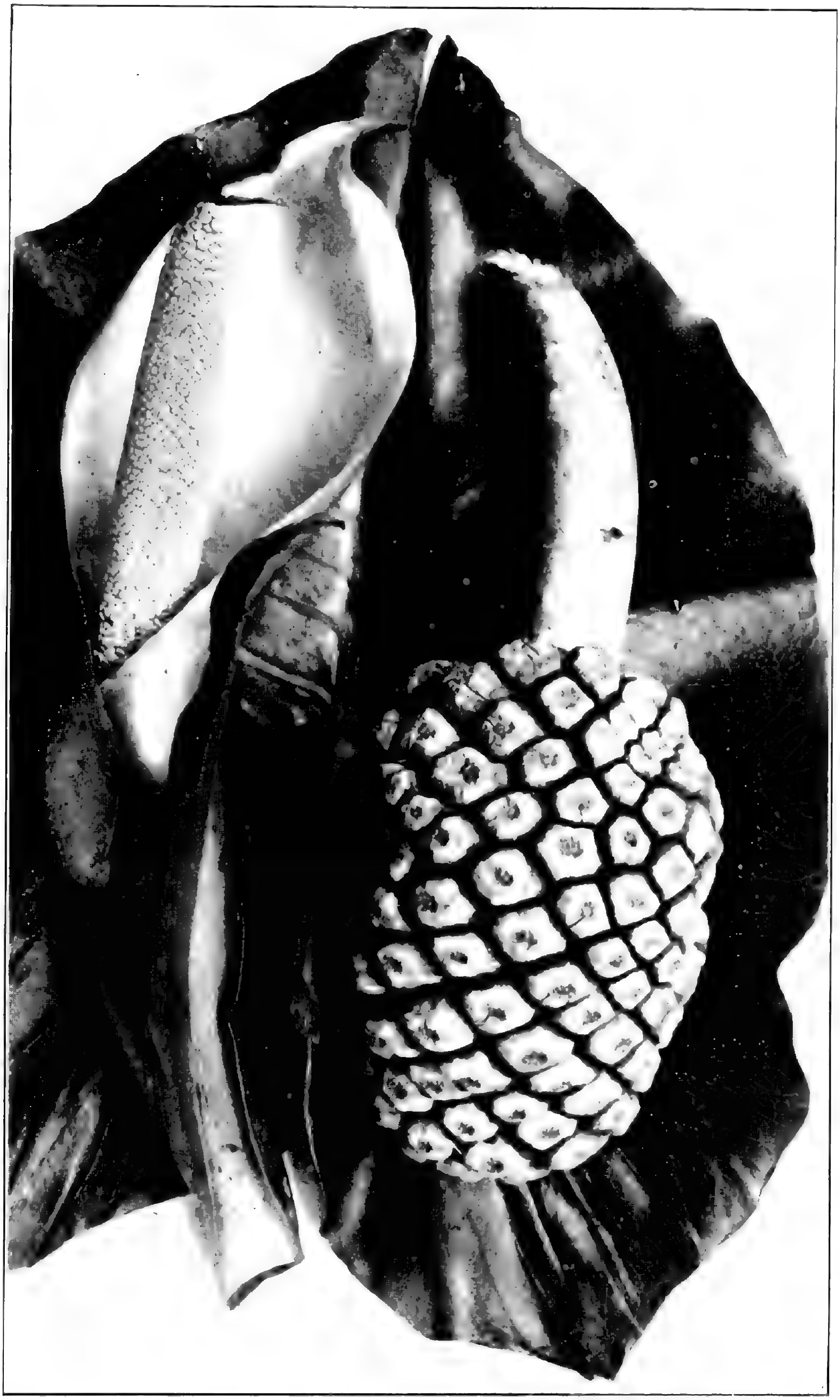


COROZO PALM (ATTALEA GOMPHOCOCCA)

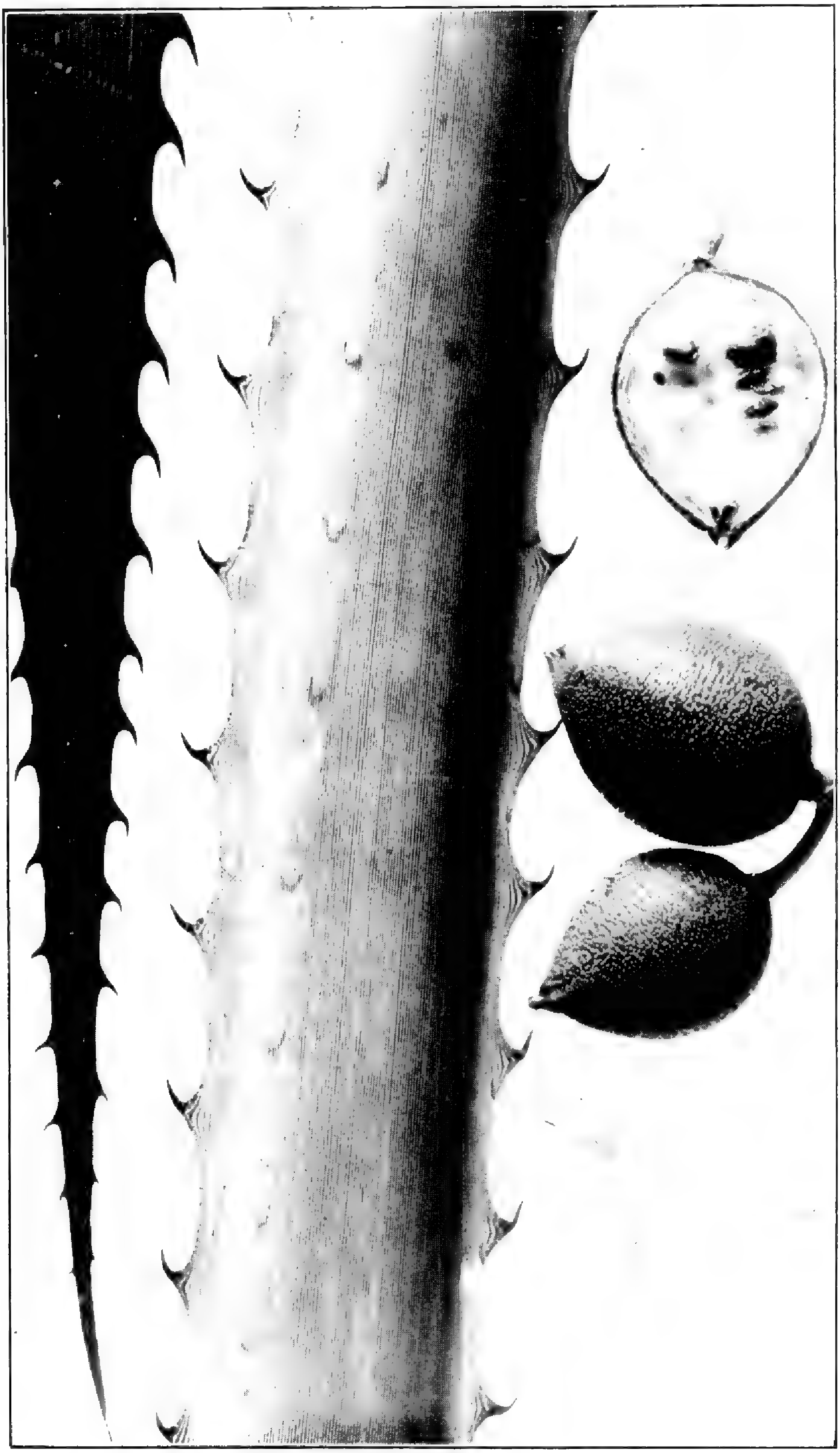


A FLOWERING PLANT OF CYCLANTHUS BIPARTITUS. (ABOUT HALF NATURAL SIZE)

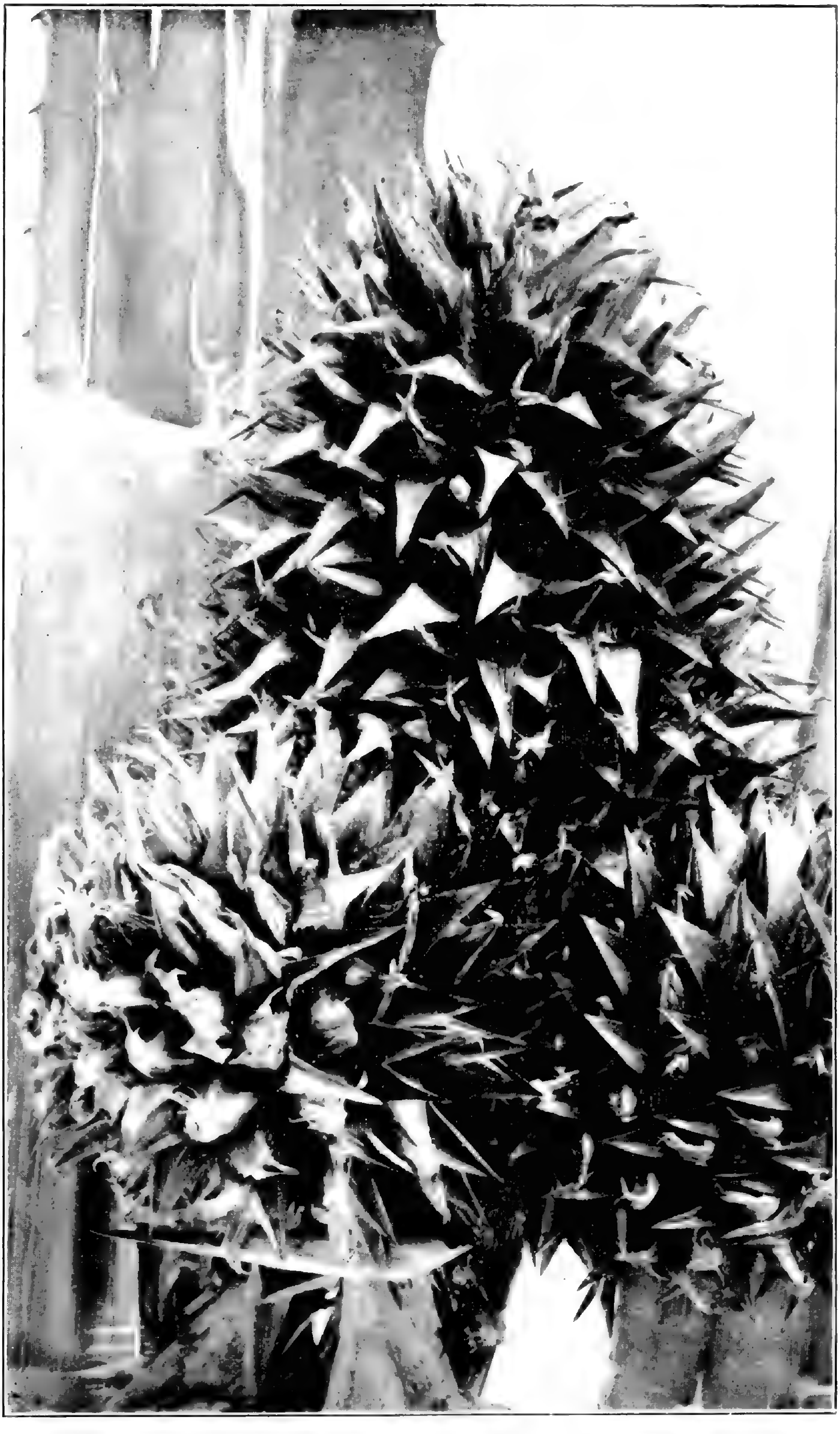
PANAMA HATPALM (CARLUDOVICA PALMATA) IN CULTIVATION IN PANAMA



LEAF, INFLORESCENCE, AND FRUIT OF MONTRICHARDIA ARBORESCENS.
(ABOUT HALF NATURAL SIZE)

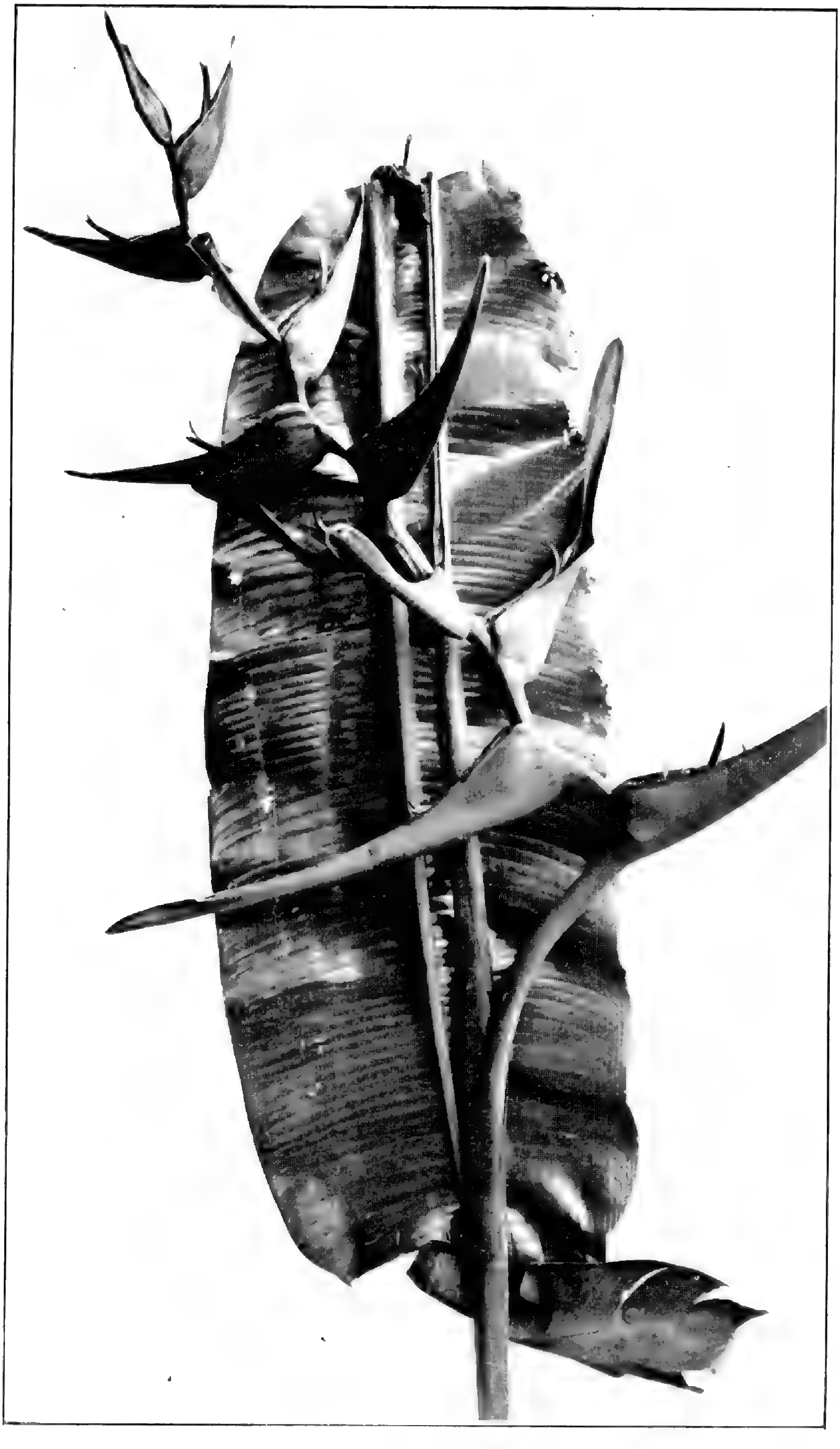


LEAVES AND FRUITS OF BROMELIA PINGUIN. (NATURAL SIZE)

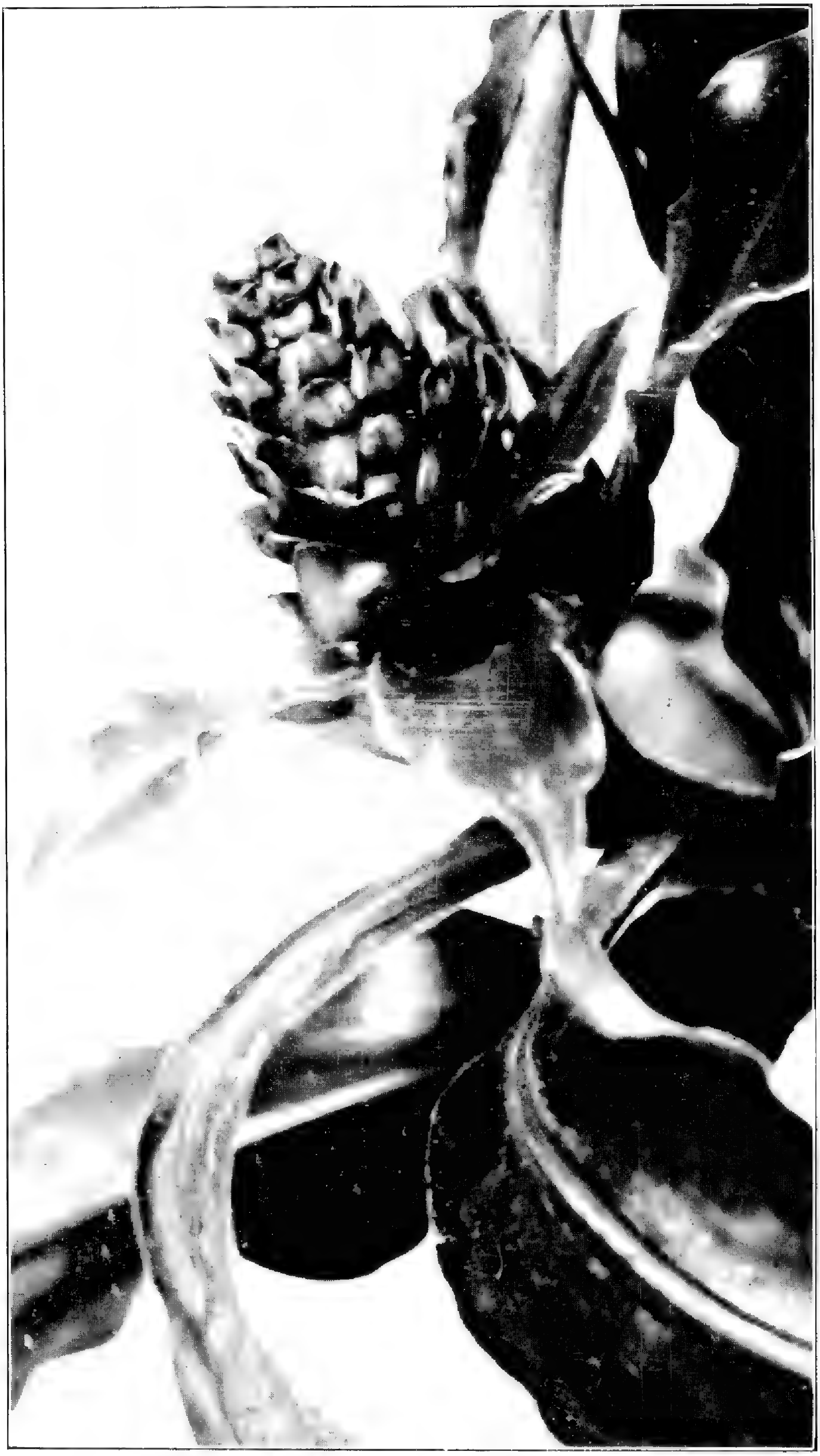


LEAVES AND INFLORESCENCES OF PITA FLOJA (ANANAS MAGDALENAE.)
(ABOUT HALF NATURAL SIZE)

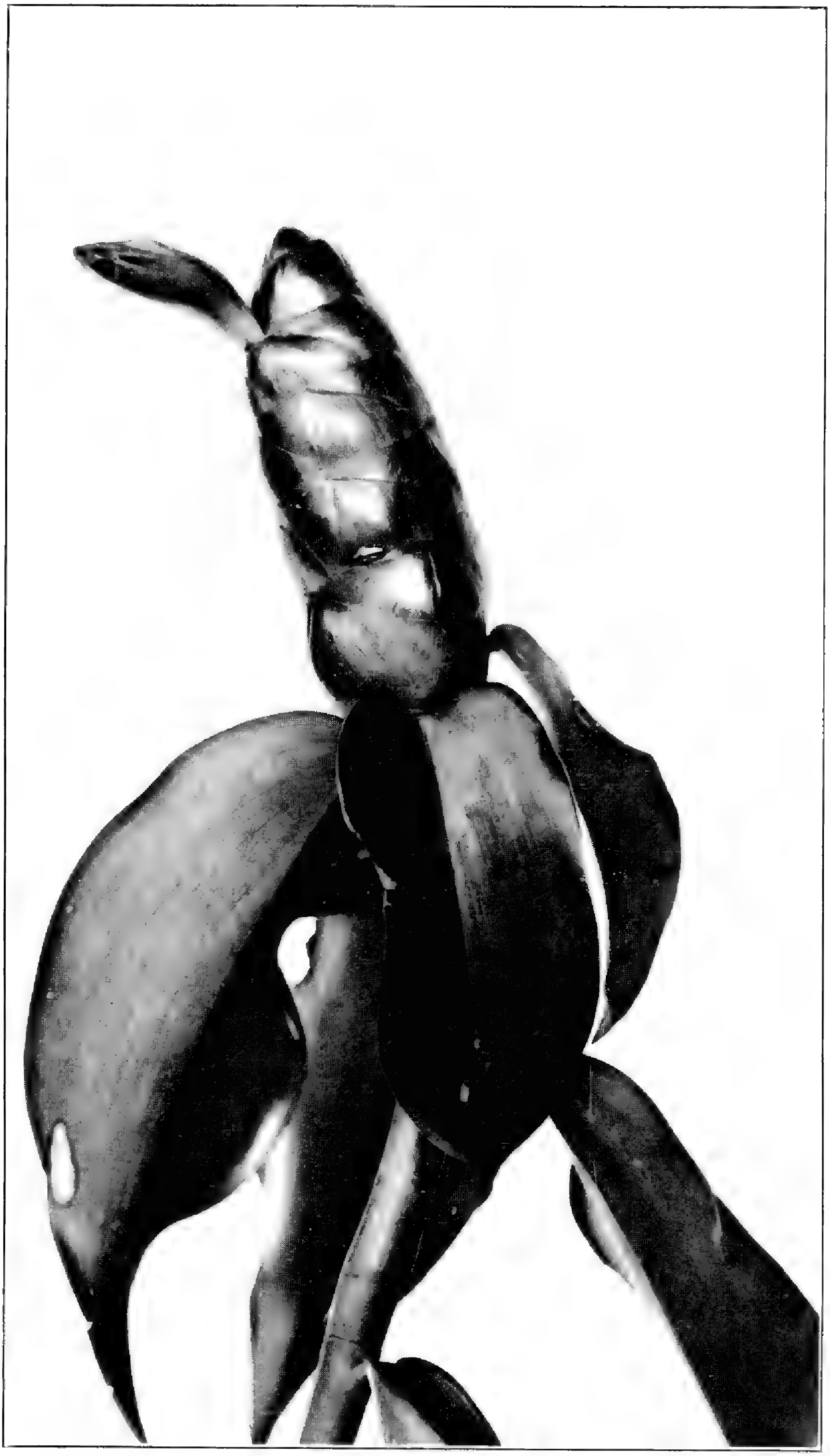
BEEFSTEAK HELICONIA (HELICONIA MARIAE)



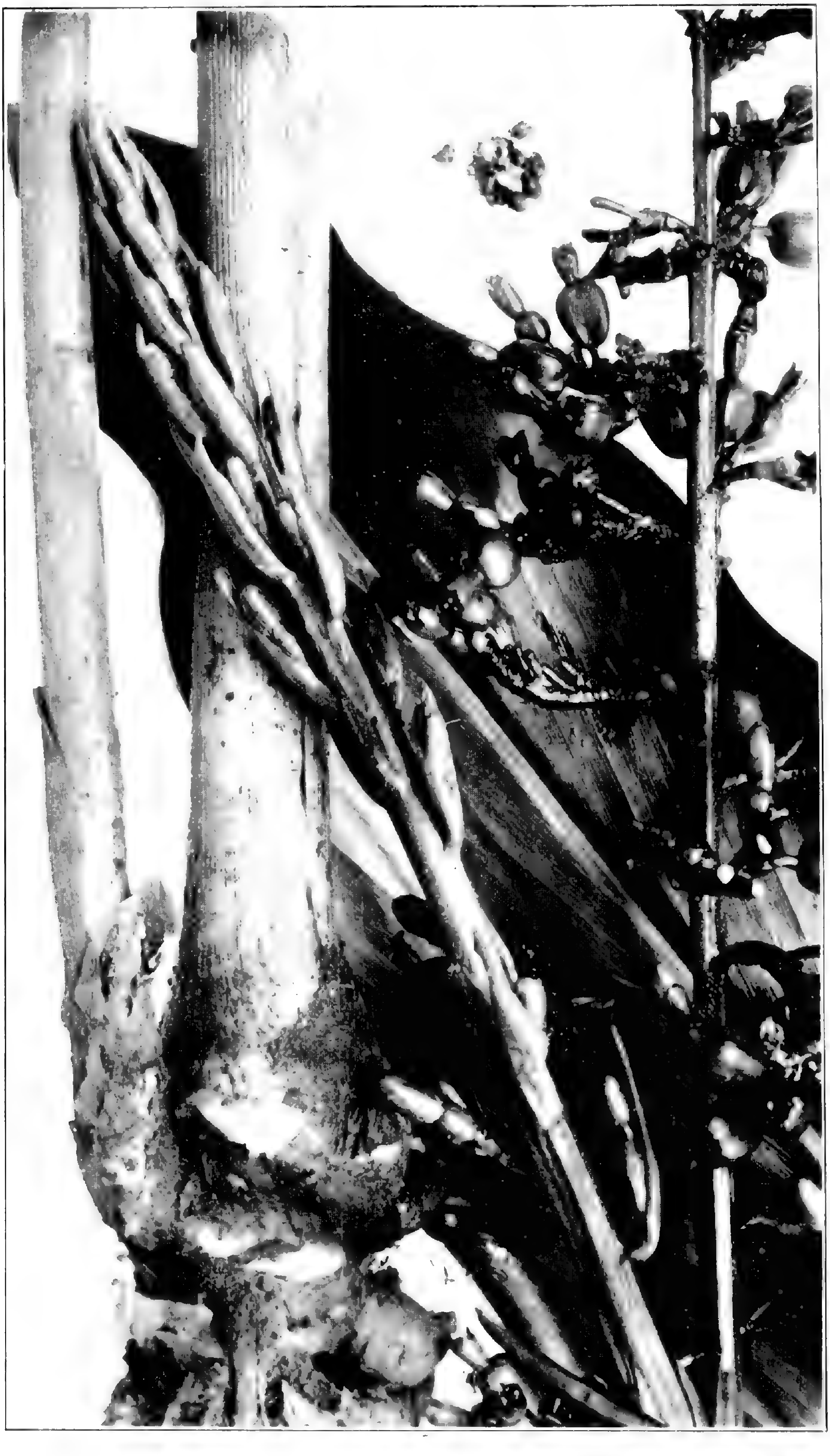
LEAF AND INFLORESCENCE OF HELICONIA LATISPATHA. (ABOUT ONE-THIRD NATURAL SIZE)



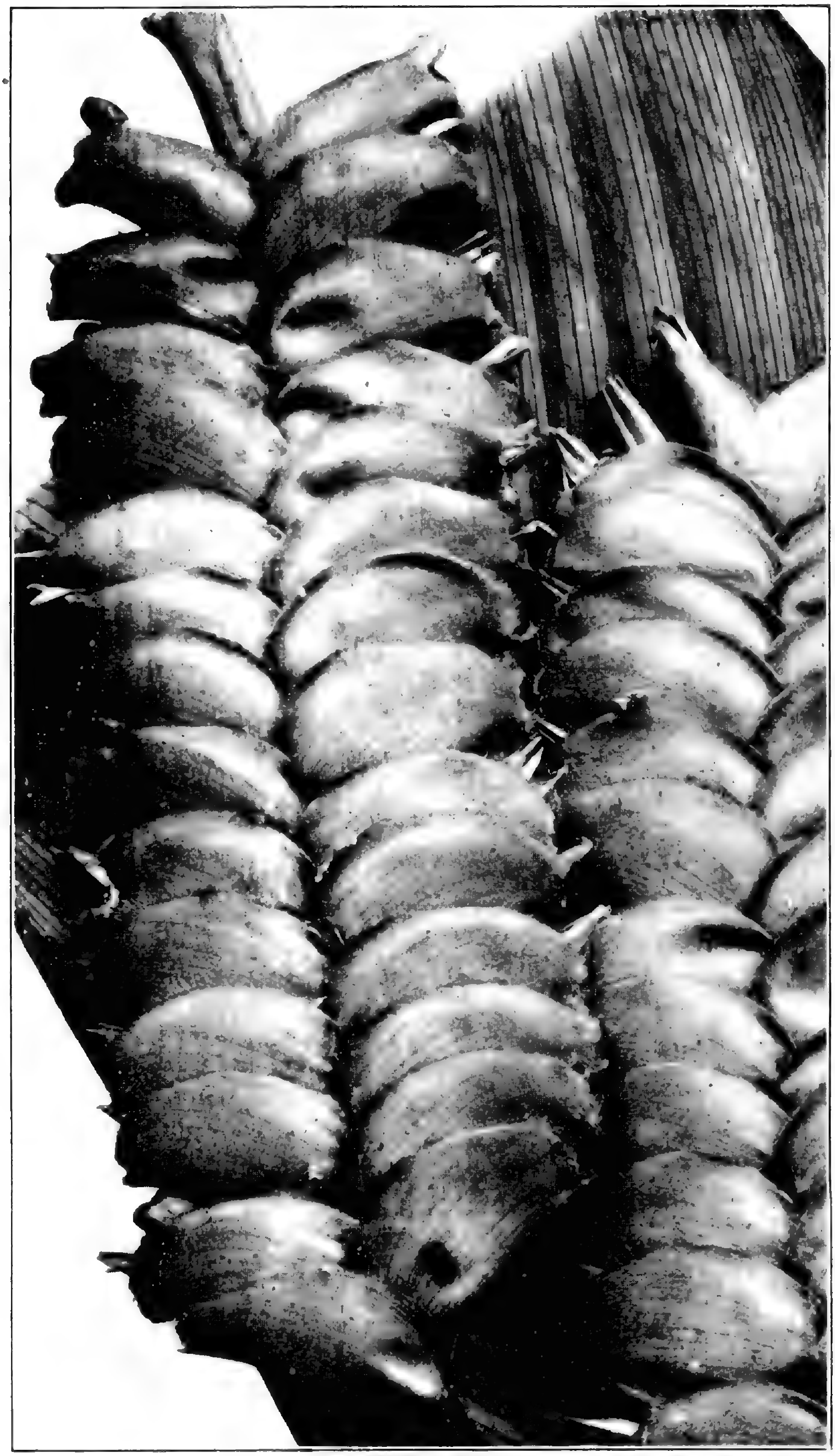
YOUNG INFLORESCENCE OF COSTUS VILLOSISSIMUS. (ABOUT HALF NATURAL SIZE)



INFLORESCENCE OF COSTUS SPICATUS. (ABOUT TWO-THIRDS NATURAL SIZE)

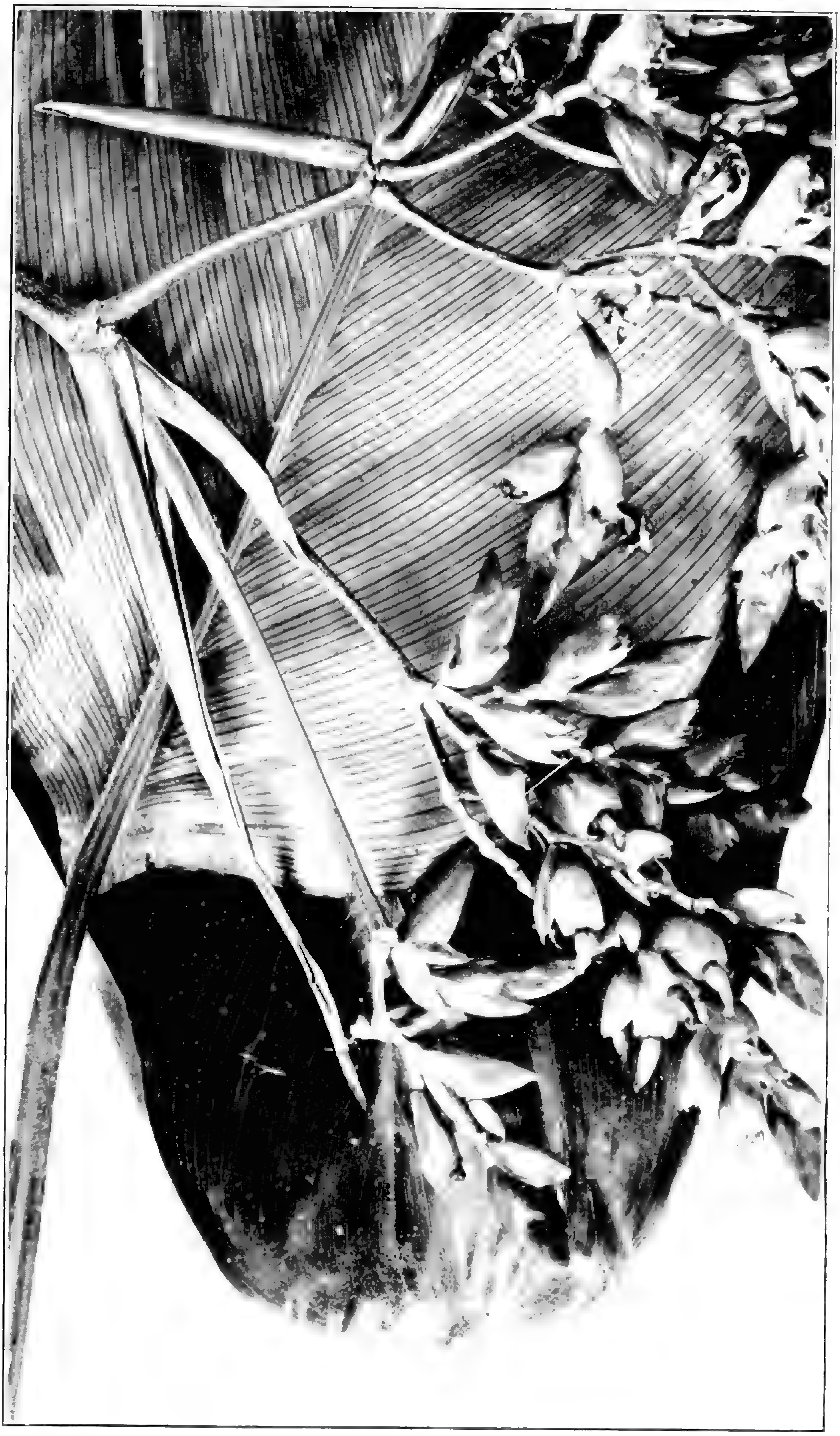


RENEALMIA AROMATICA. BASE OF PLANT AND PORTIONS OF LEAF AND INFLORESCENCE. (SLIGHTLY LESS THAN NATURAL SIZE)

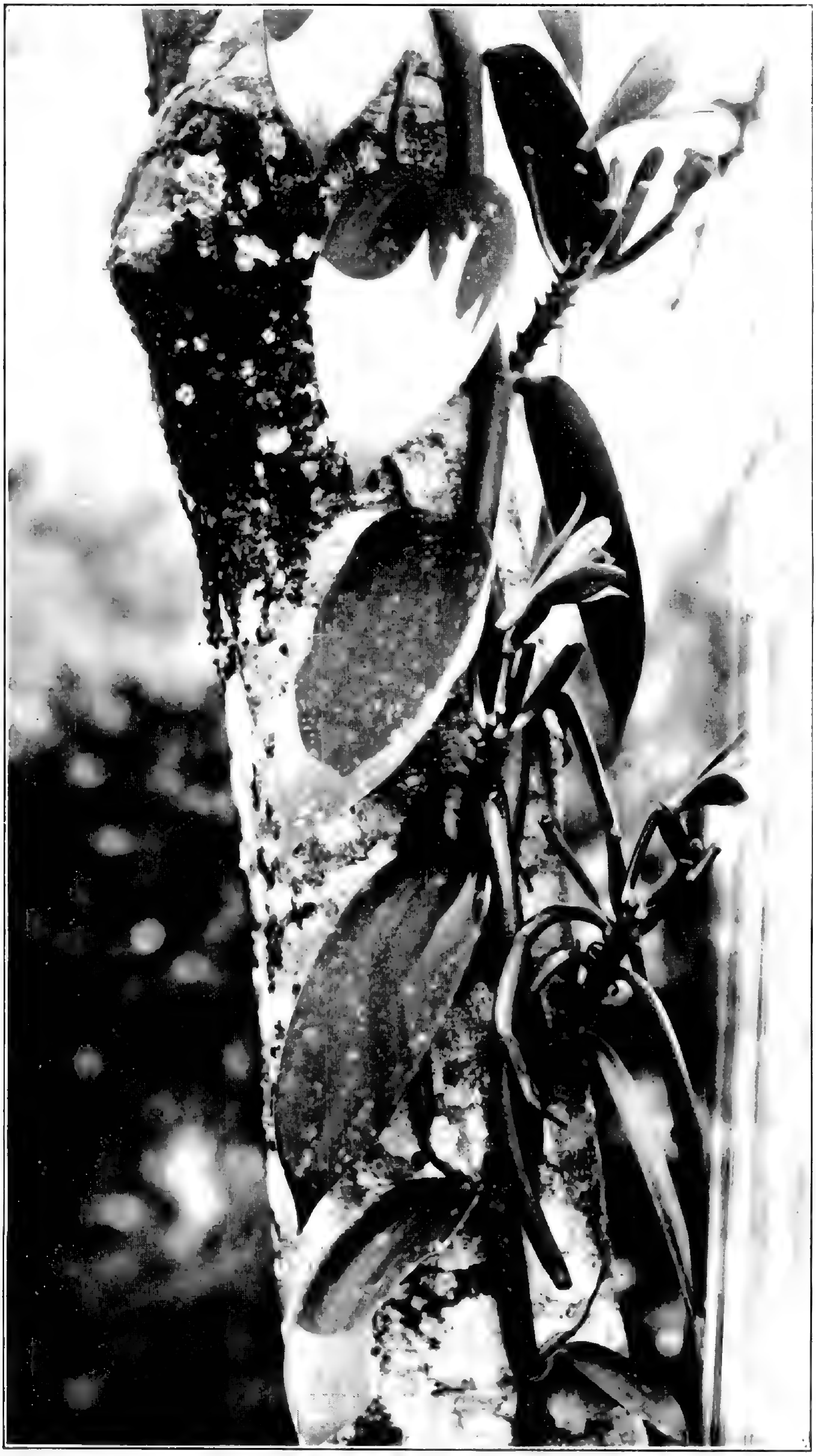


PORTION OF INFLORESCENCE OF CALATHEA LASIOSTACHYA. (NATURAL SIZE)

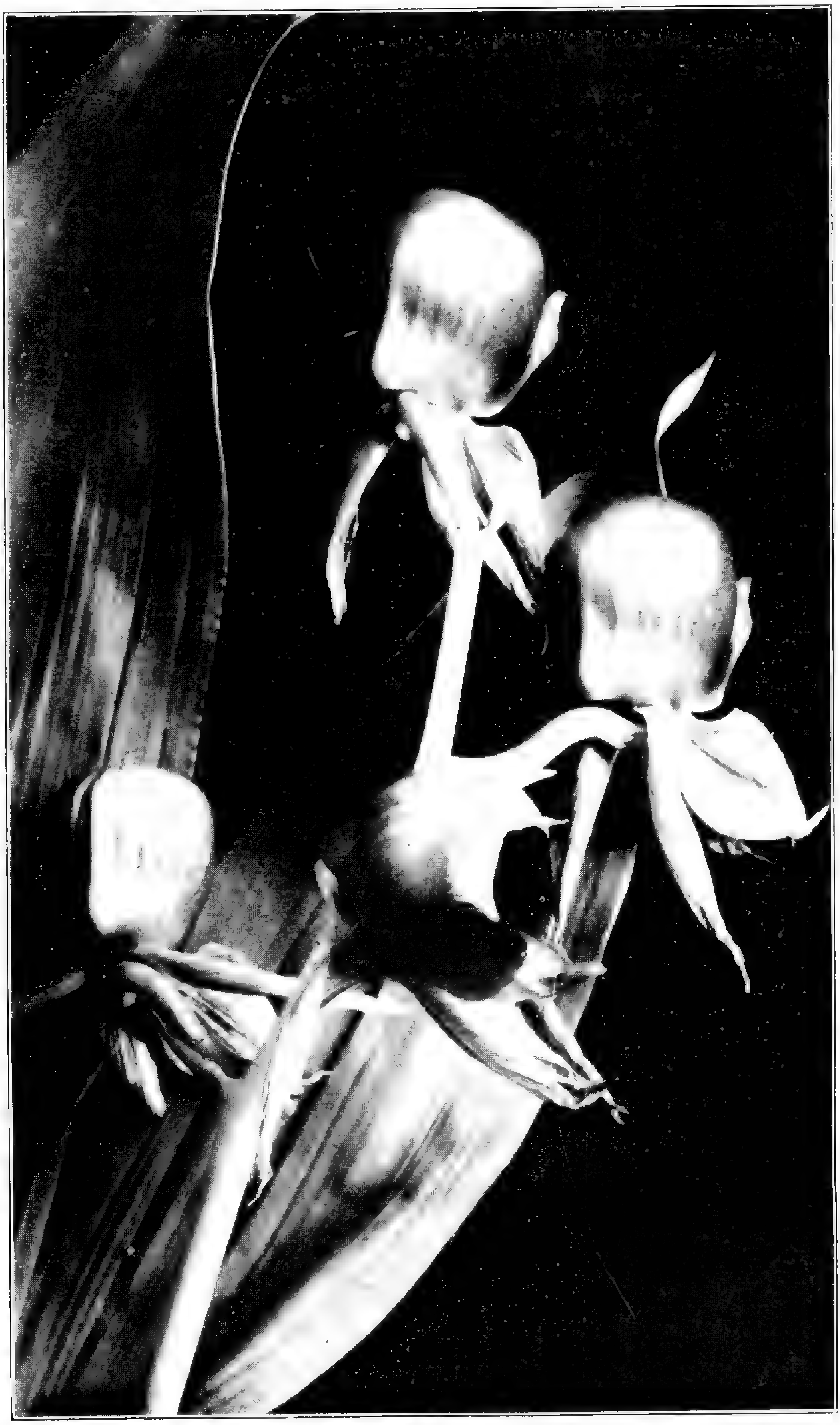
CALATHEA INSIGNIS



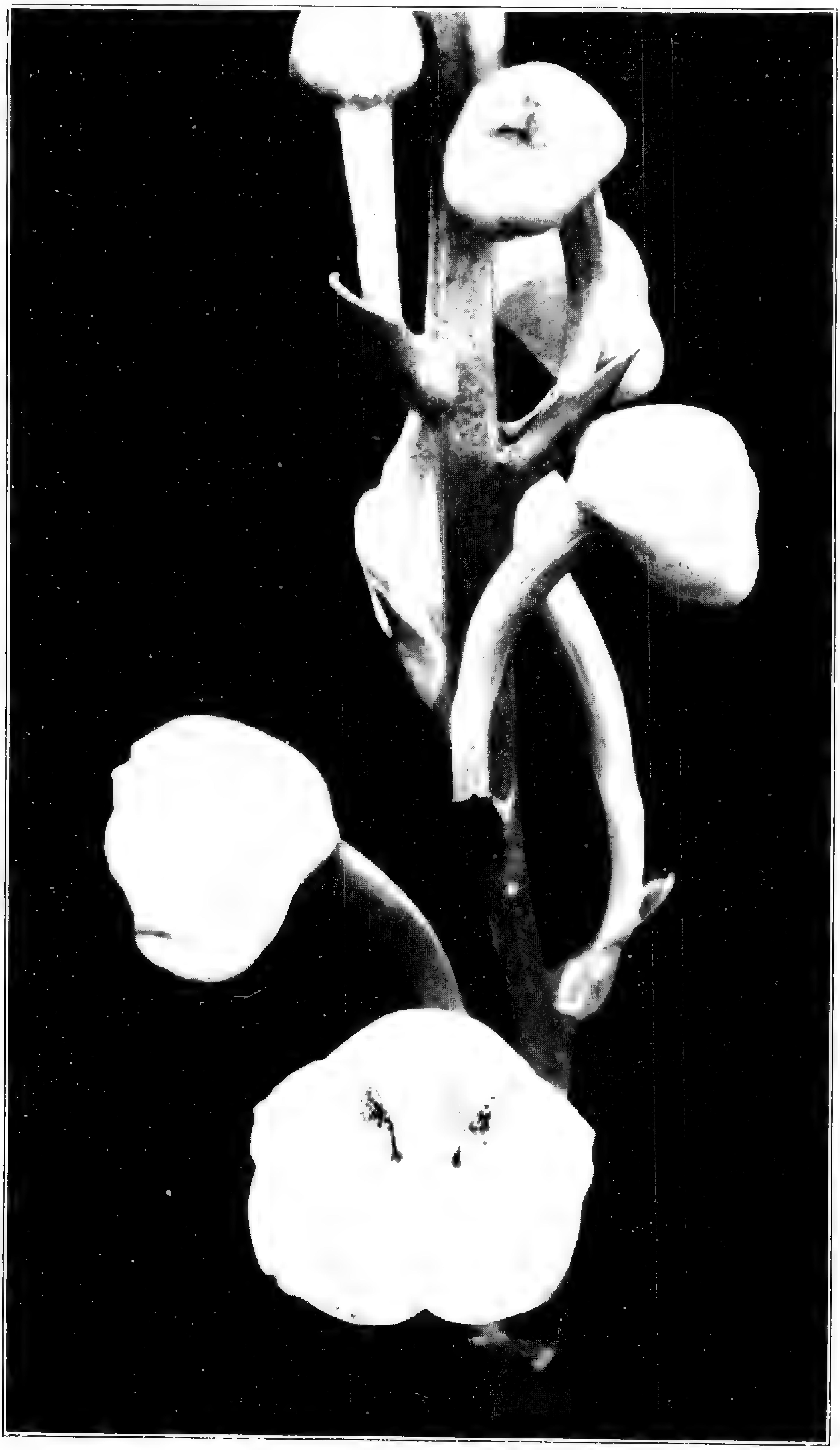
MYROSMA GUAPILENSIS. (NATURAL SIZE)



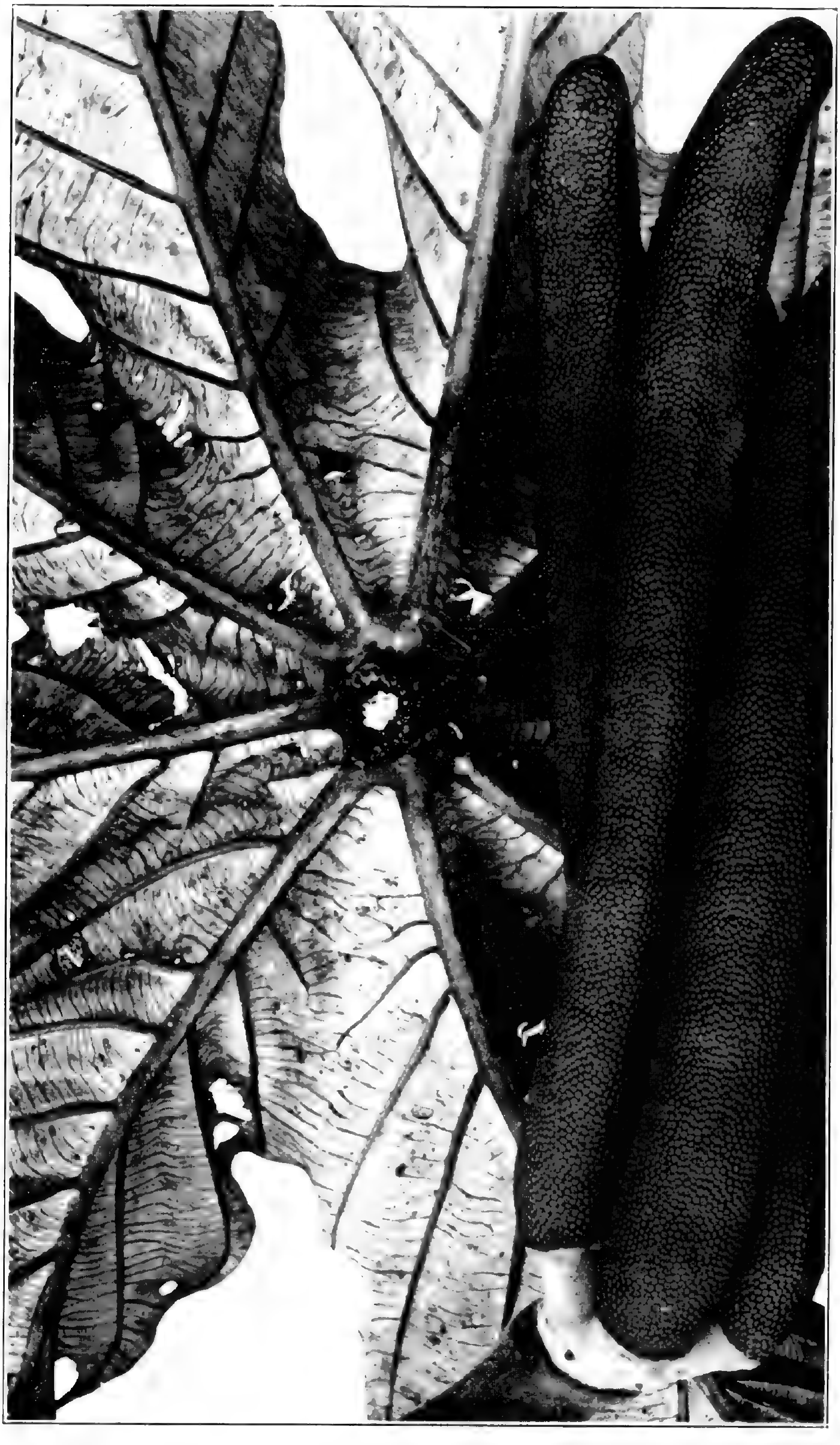
VANILLA (VANILLA FRAGRANS). (ABOUT HALF NATURAL SIZE)



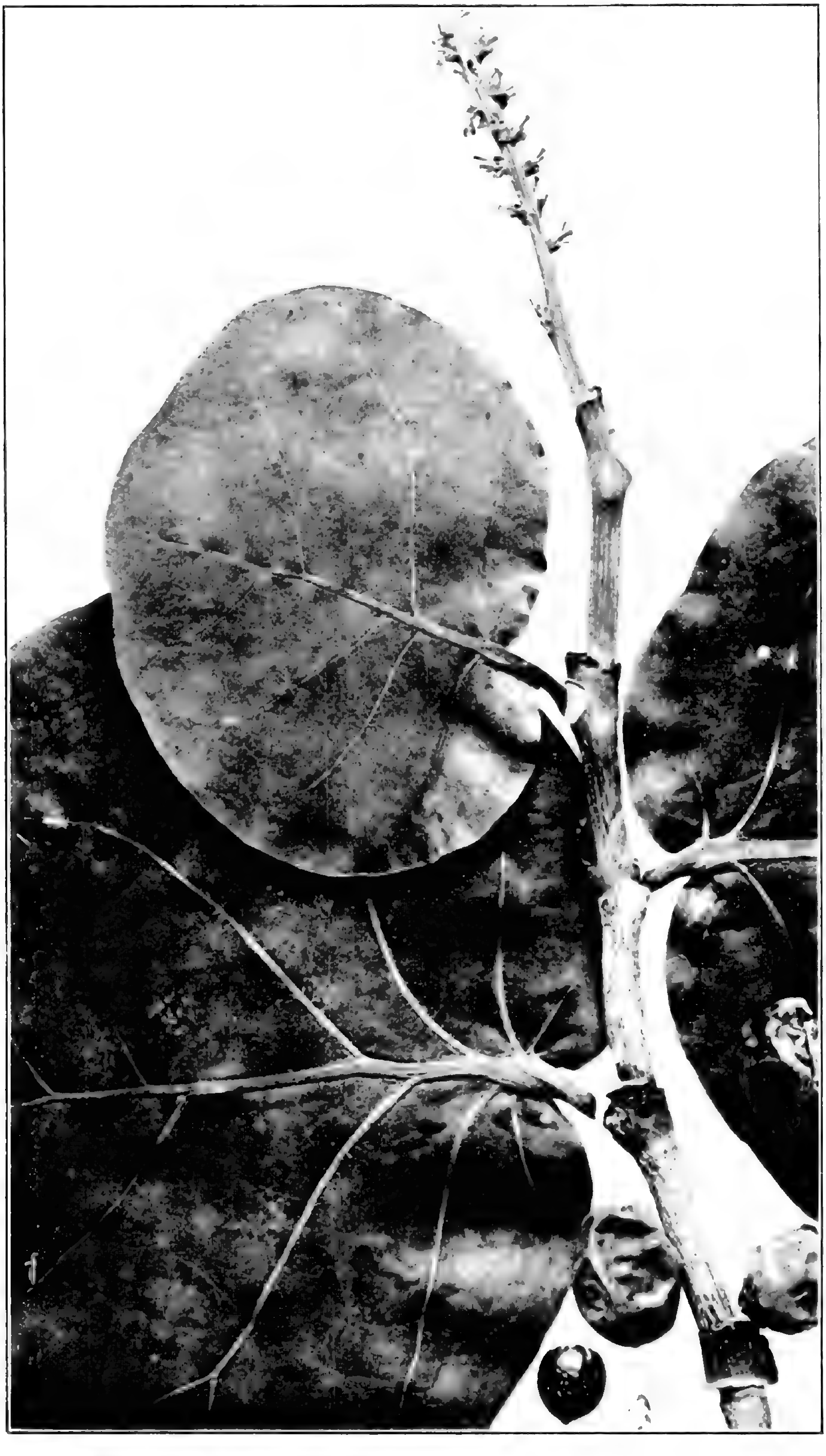
CATASETUM VIRIDIFLAVUM. A CANAL ZONE ORCHID. (NATURAL SIZE



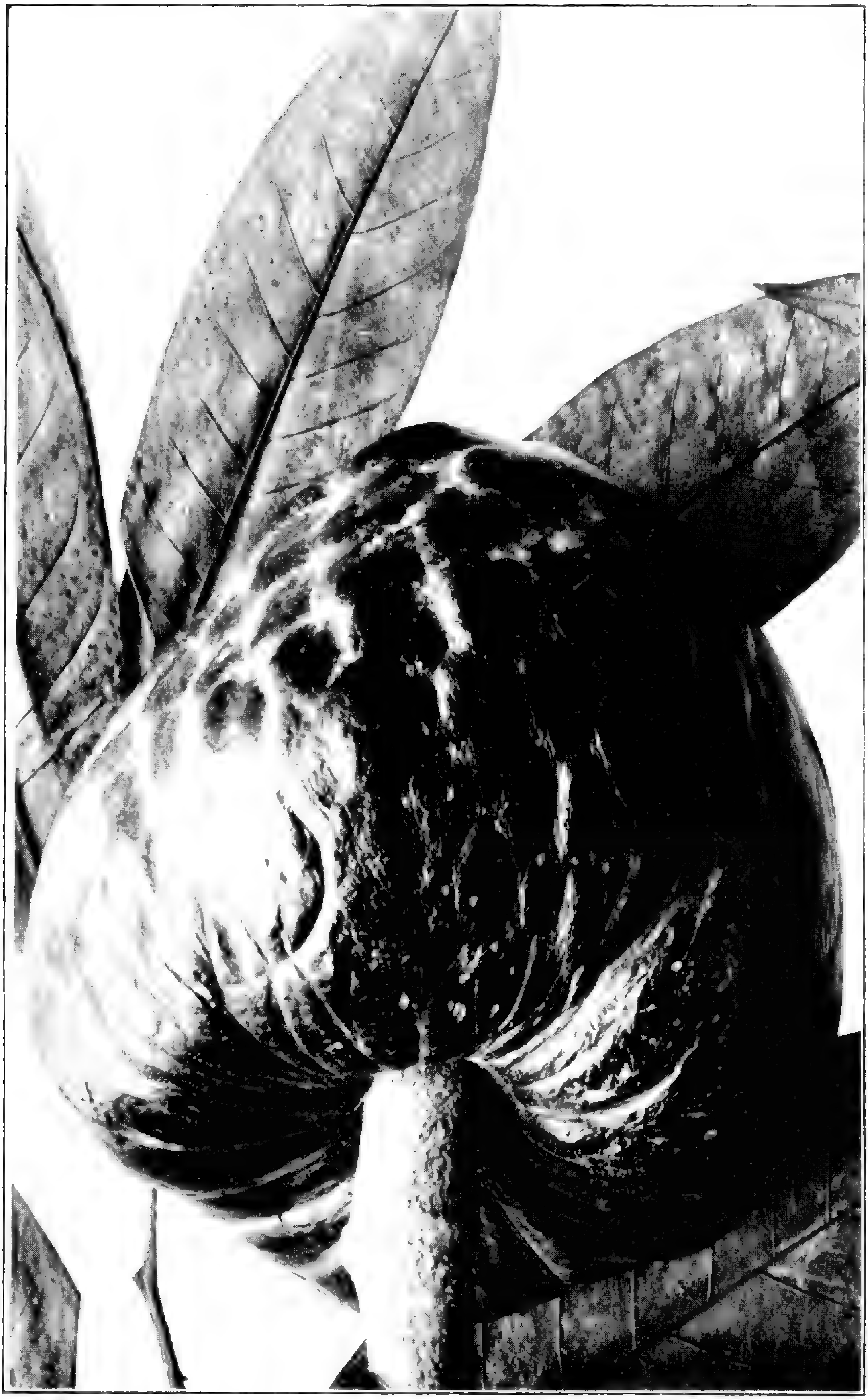
HOLY-GHOST-FLOWER (PERISTERIA ELATA). NATURAL SIZE



GUARUMO (CECROPIA MEXICANA). PORTION OF AN INFLORESCENCE AND A SMALL LEAF. (NATURAL SIZE



SEAGRAPE (COCCOLOBA UVIFERA). LEAVES, DRY FRUITS, SEEDS, AND PORTION OF AN INFLORESCENCE. (NATURAL SIZE)



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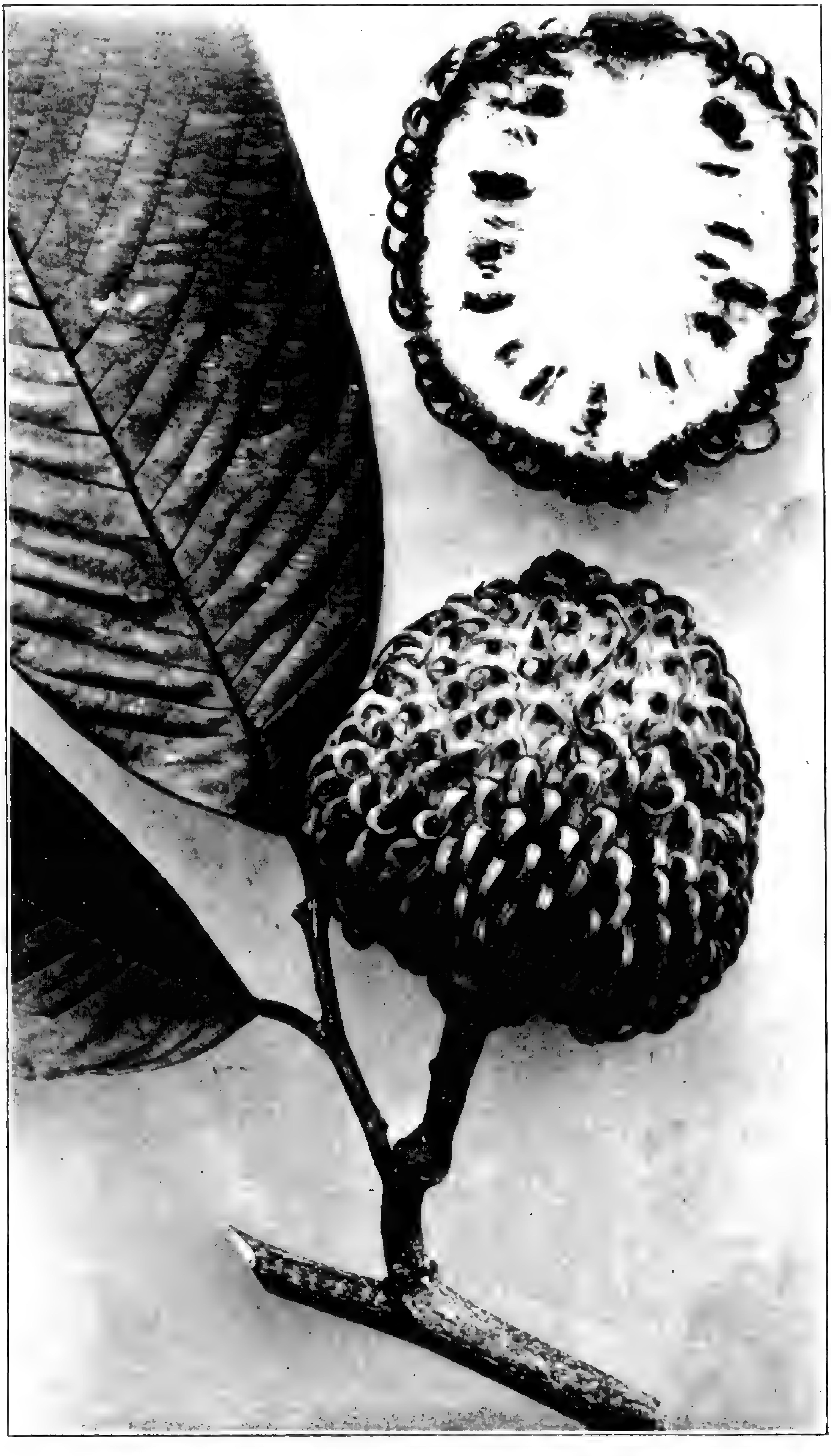
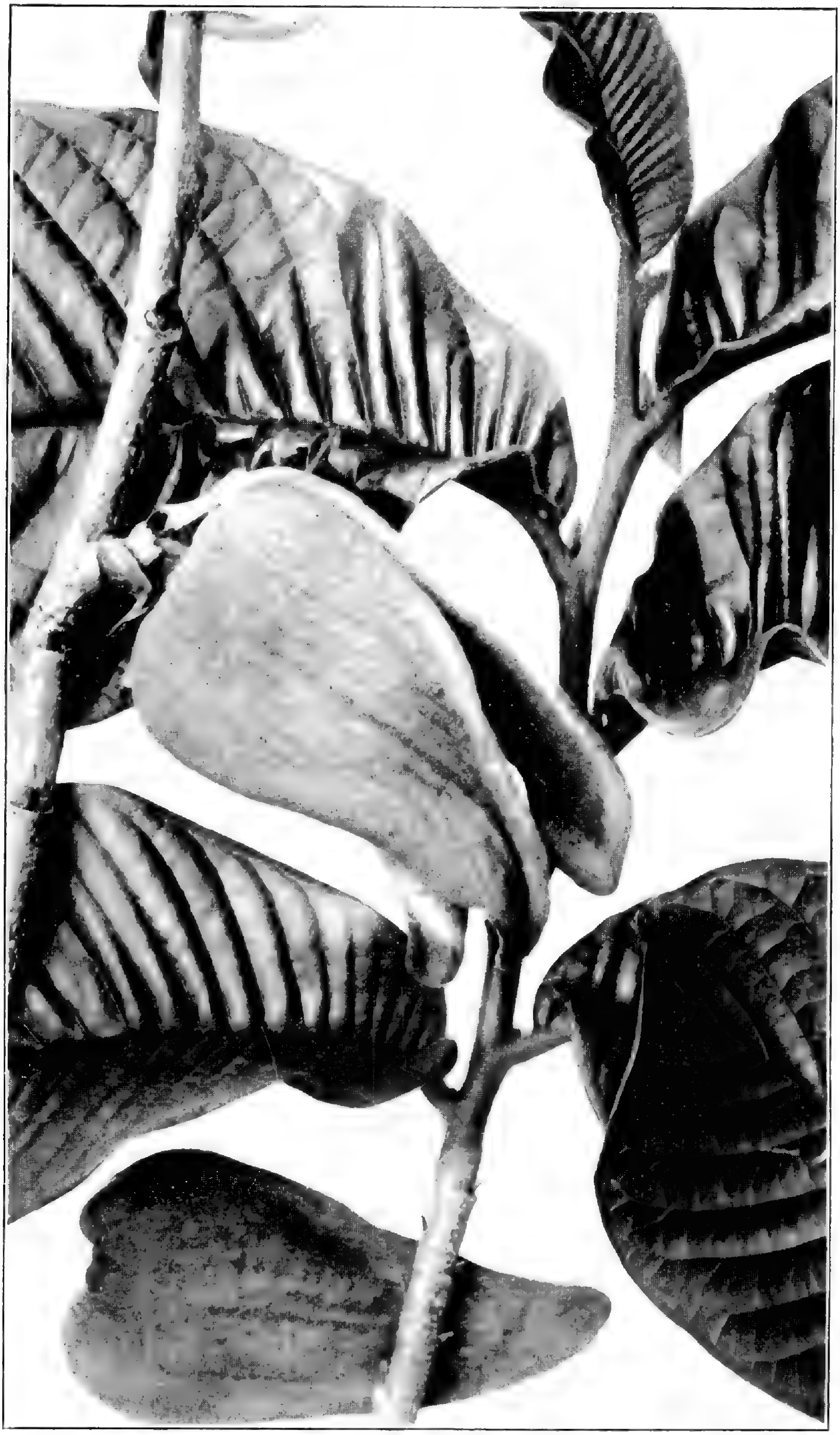


FRUIT OF ANNONA SPRAGUEI. (NATURAL SIZE



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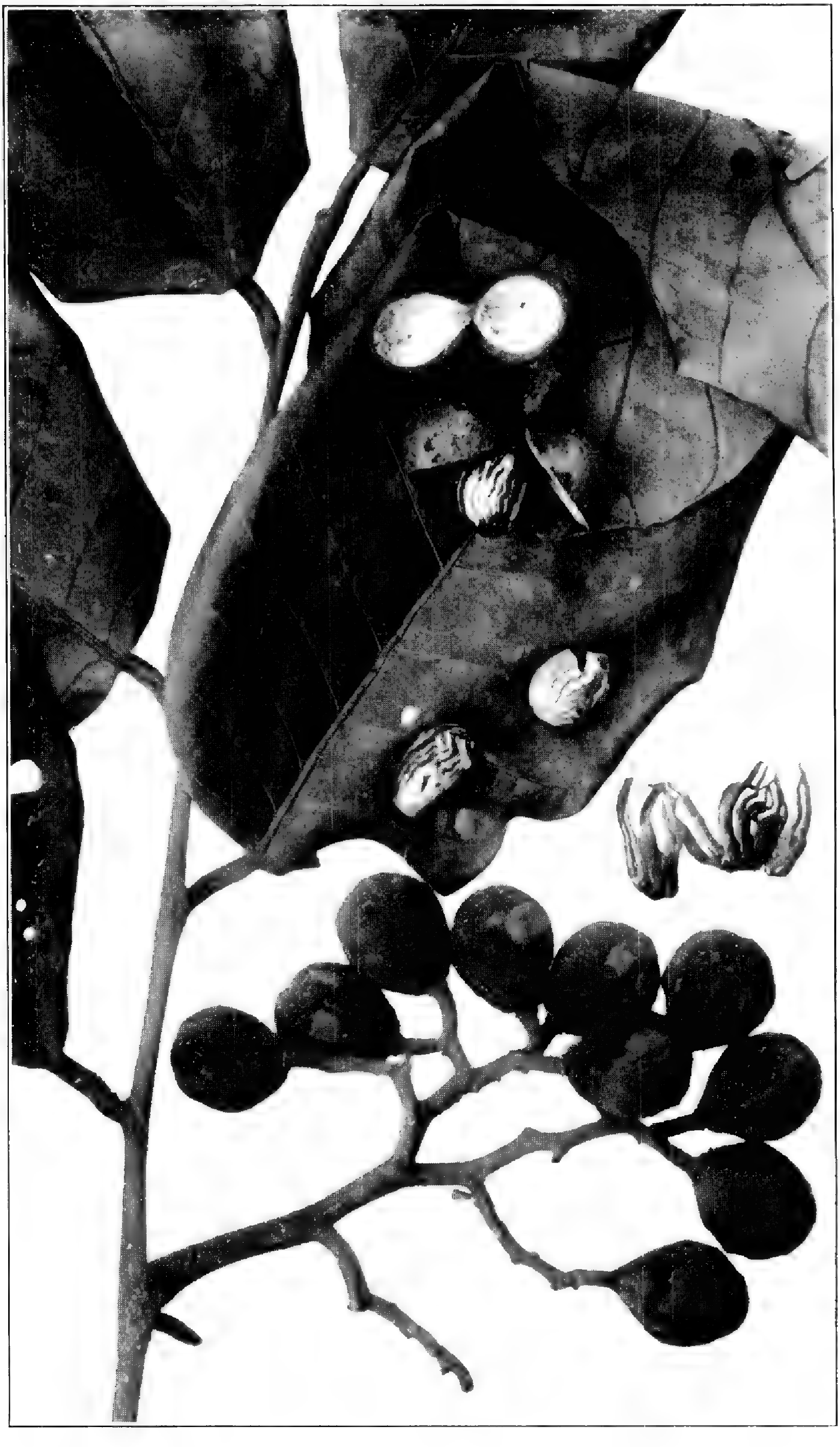
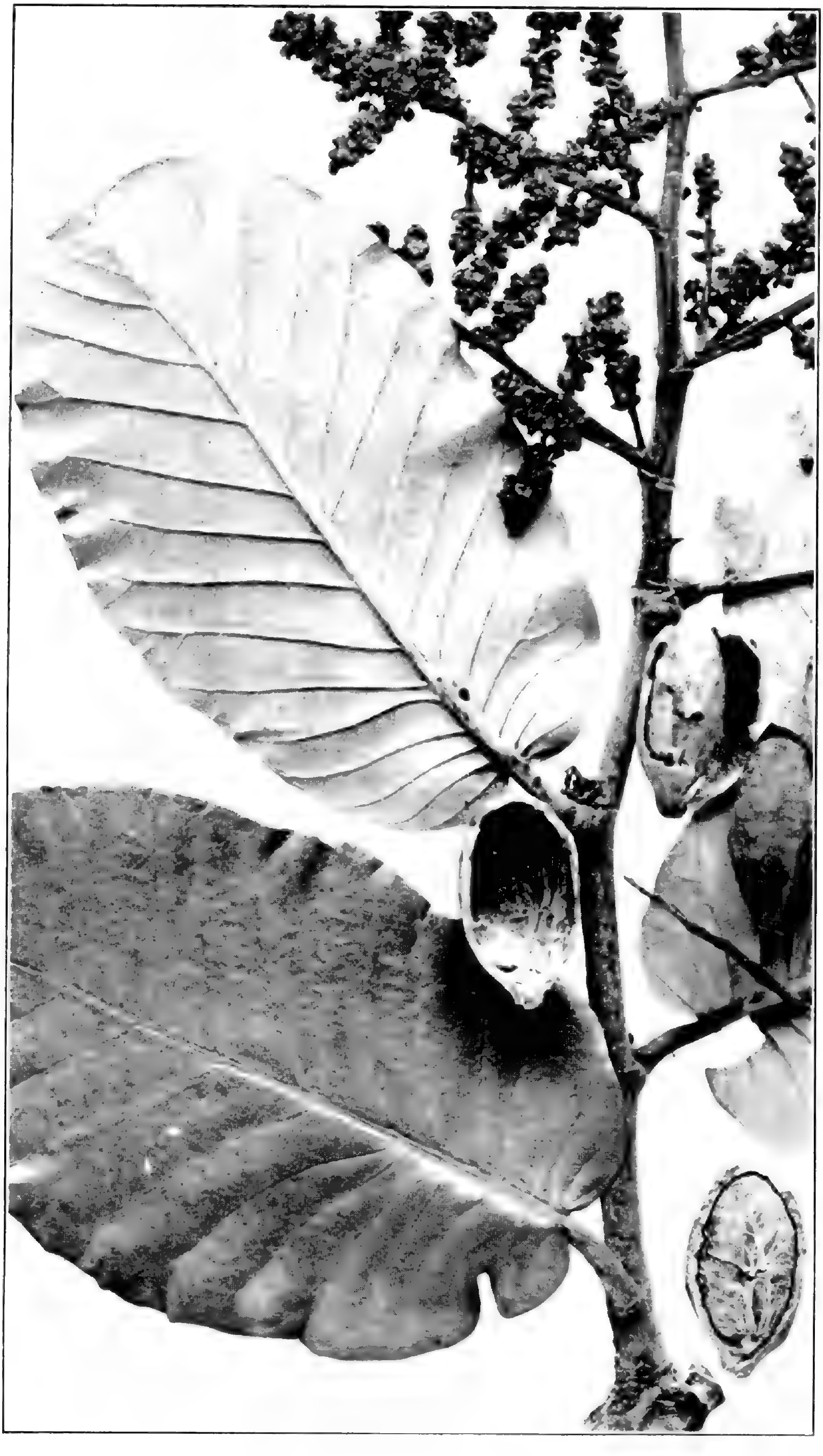


VIROLA WARBURGII. A RELATIVE OF THE NUTMEG. (NATURAL SIZE)



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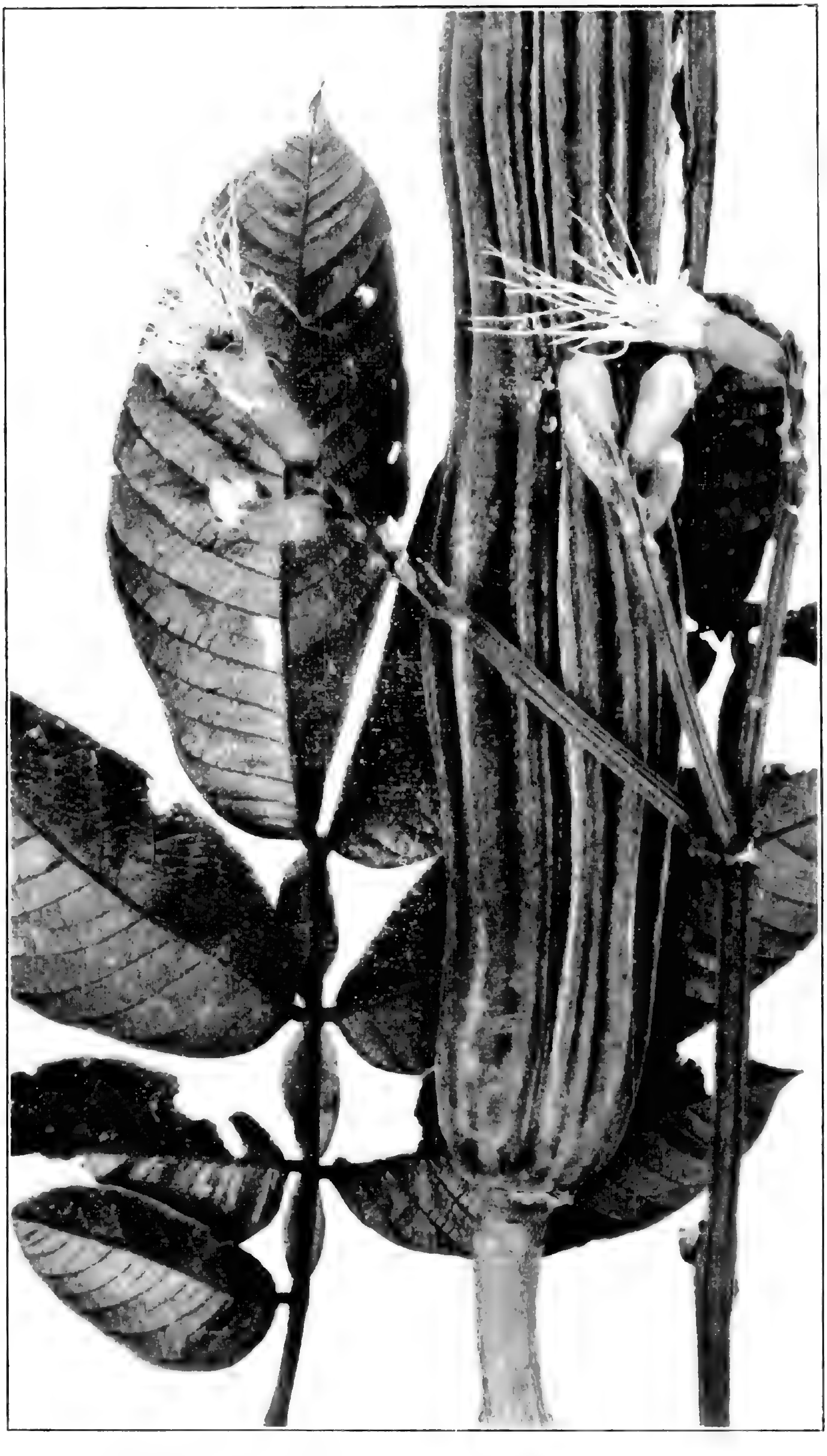

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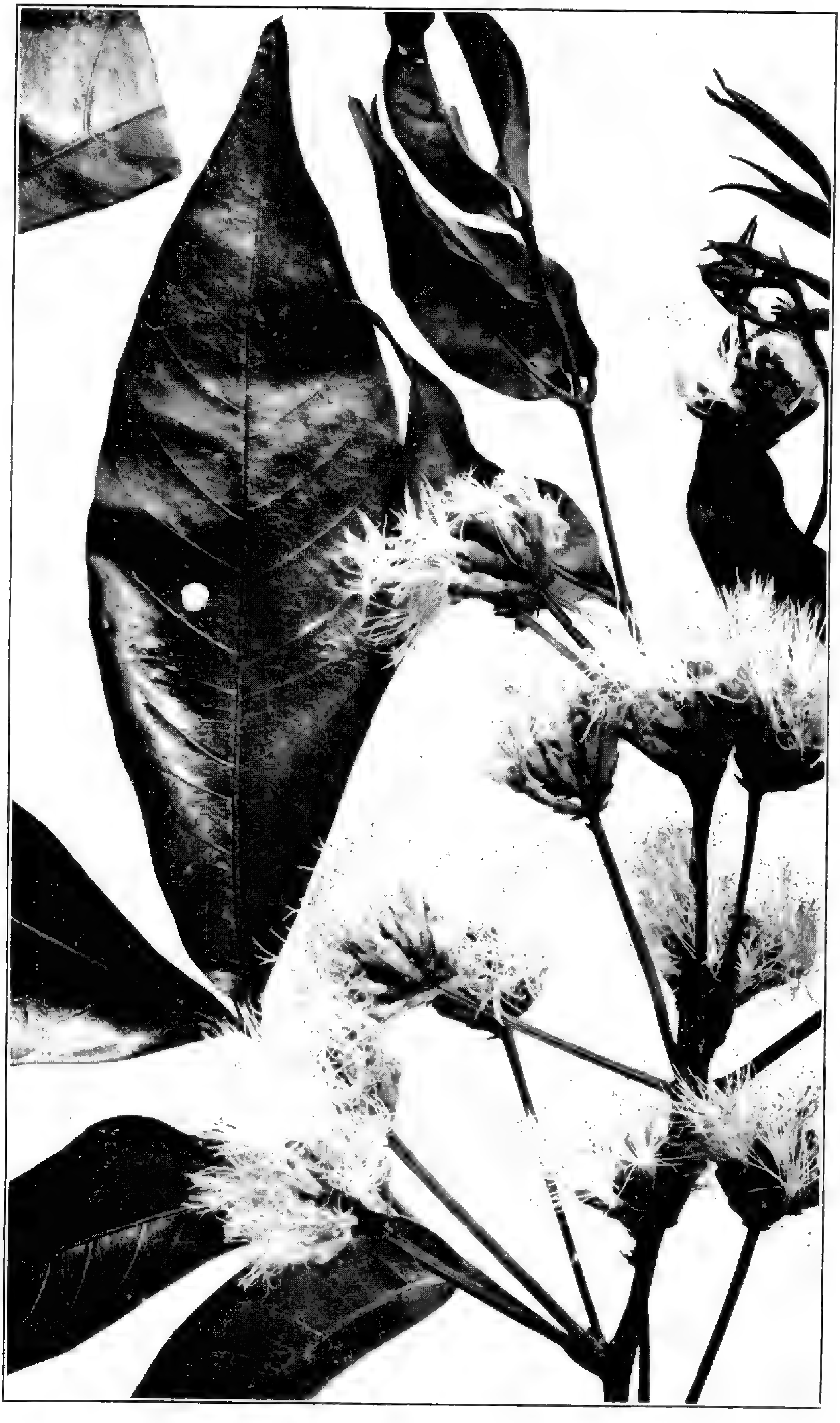

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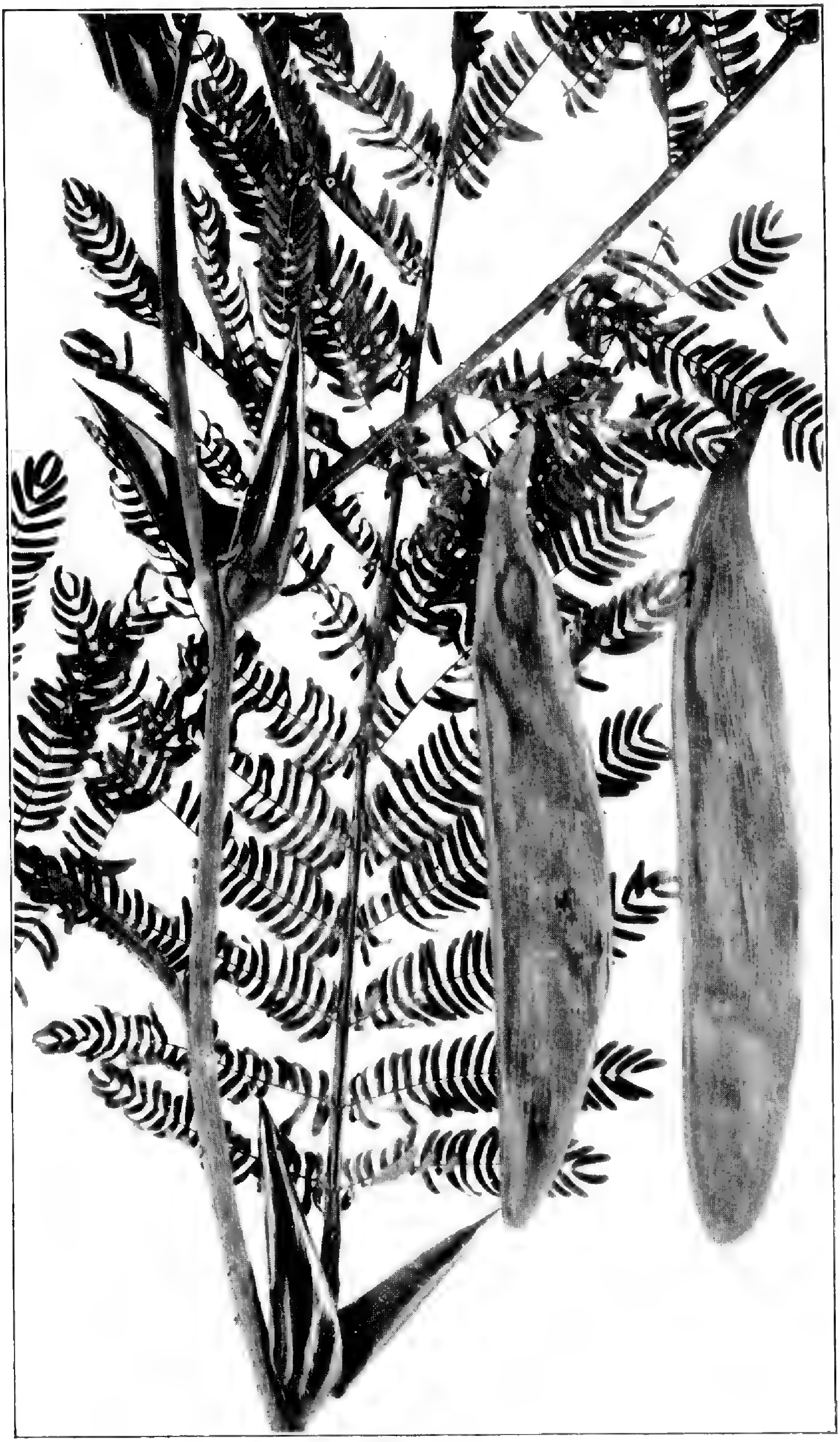

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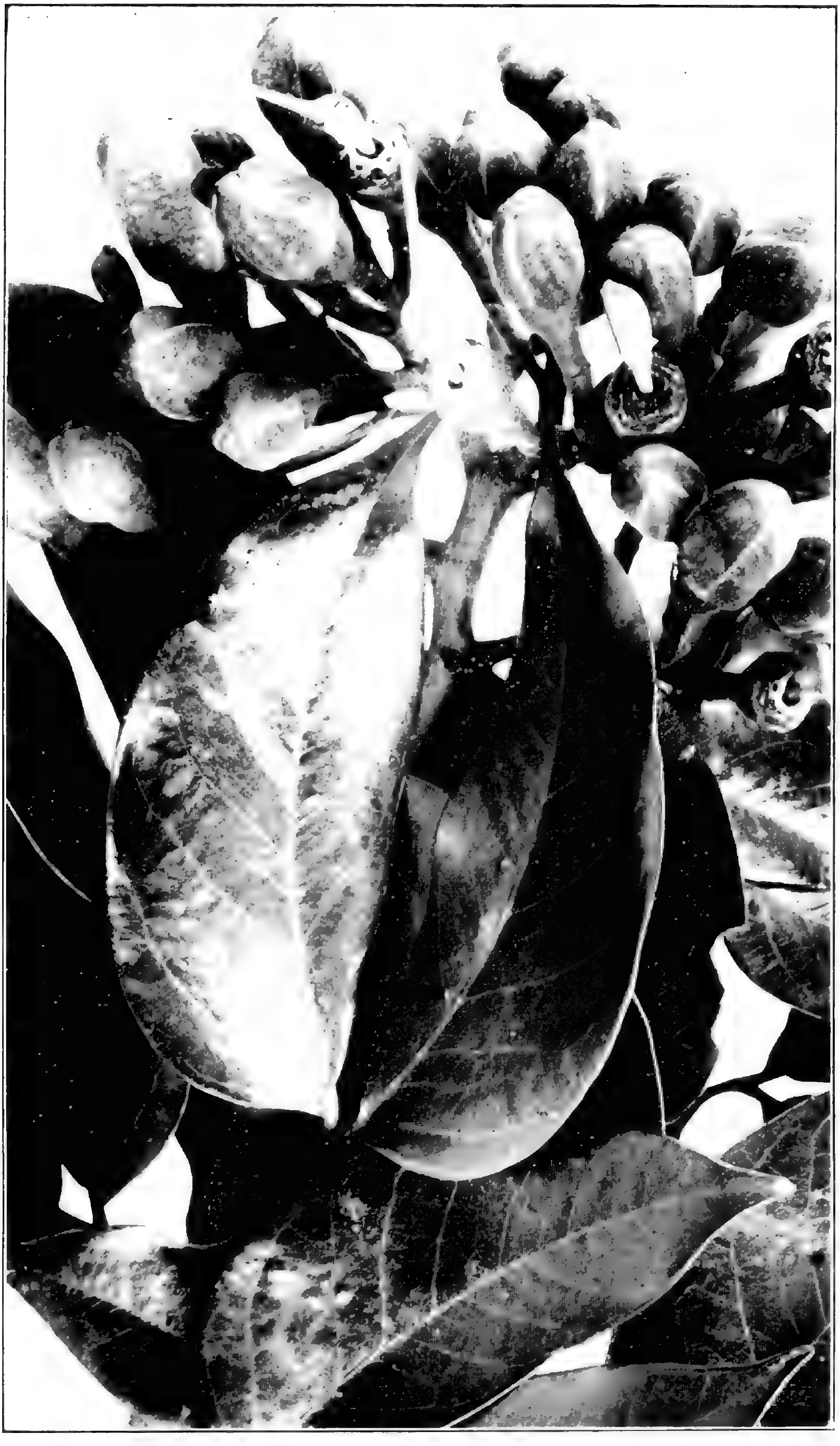

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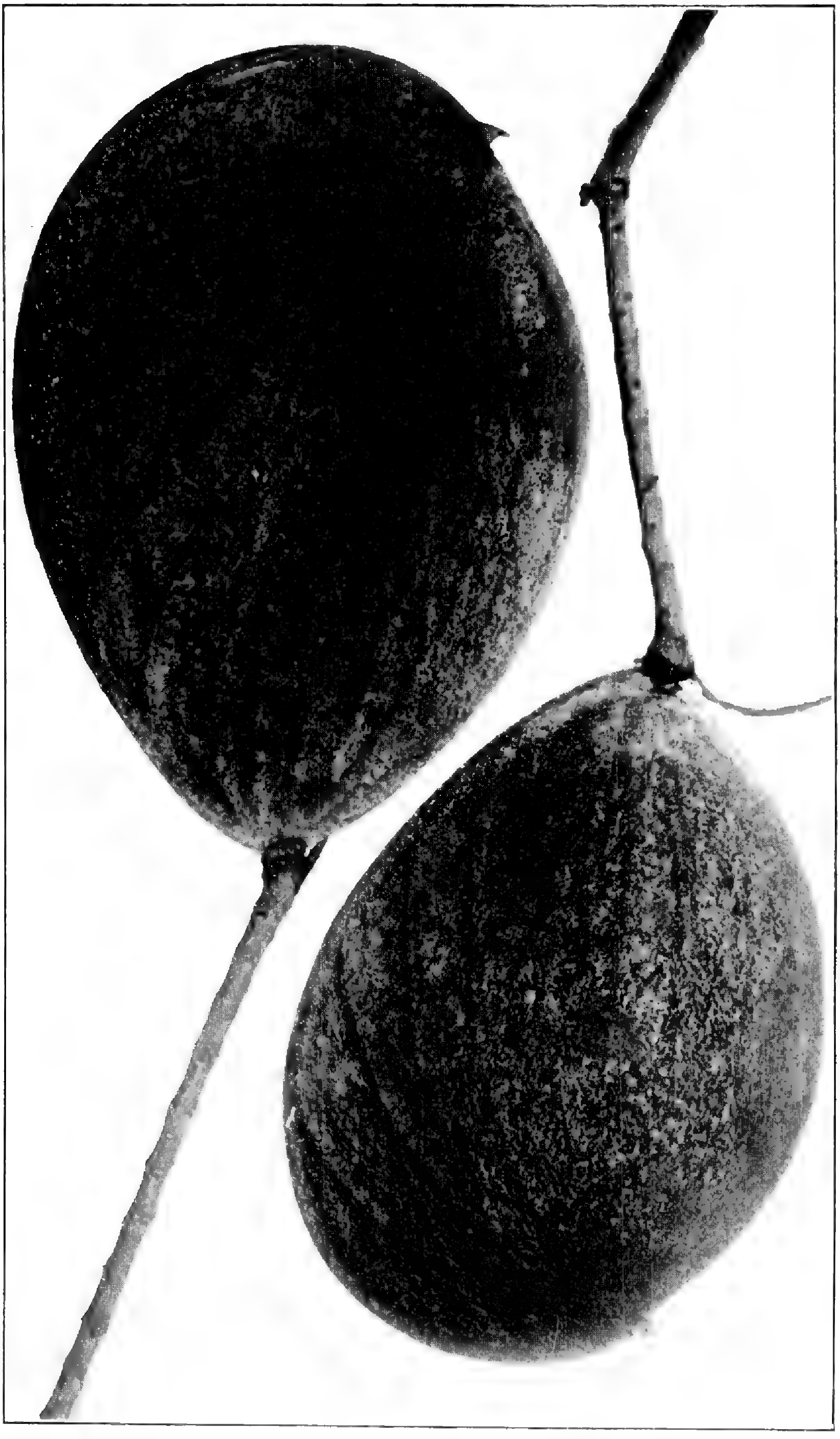

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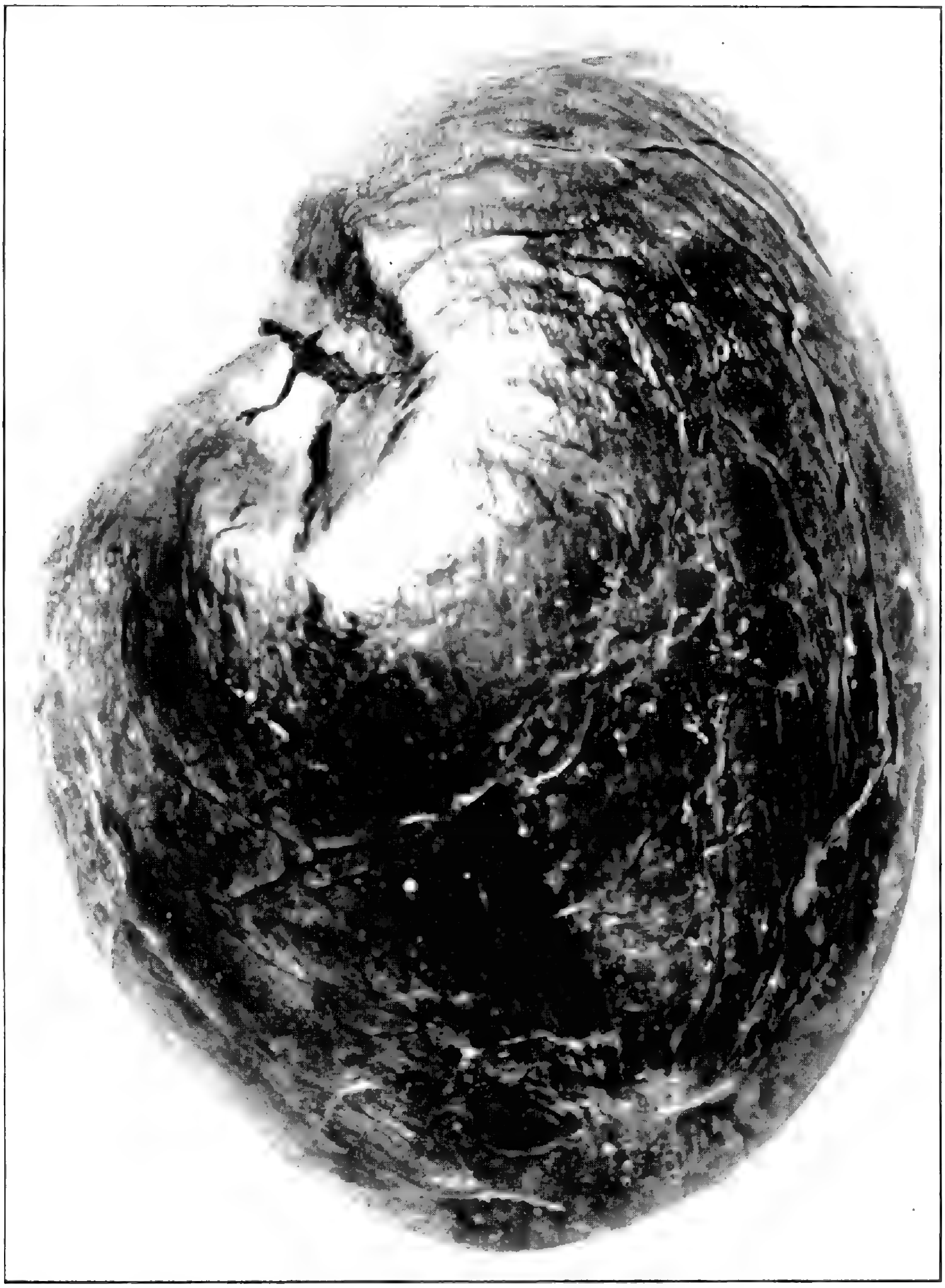

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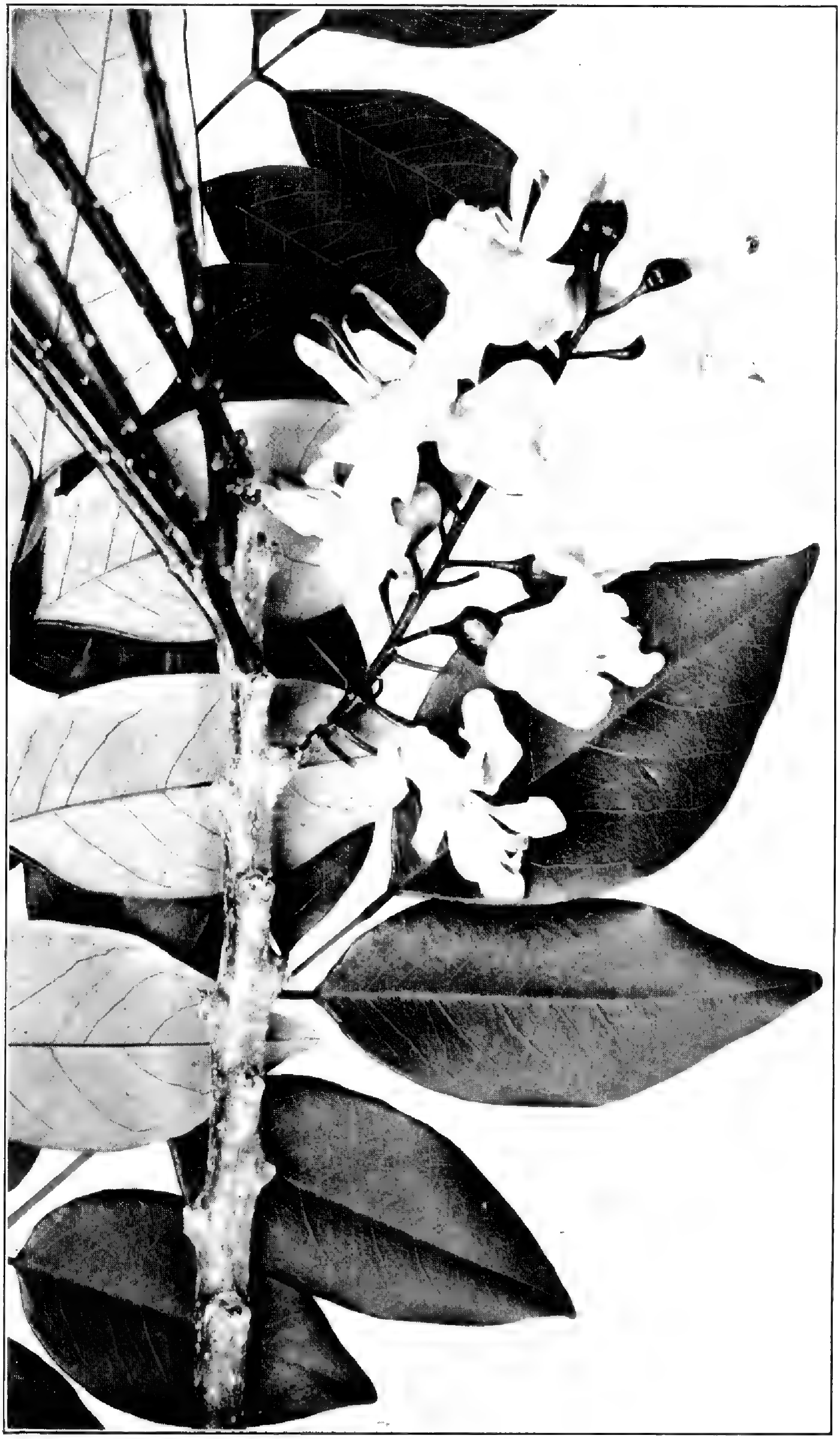

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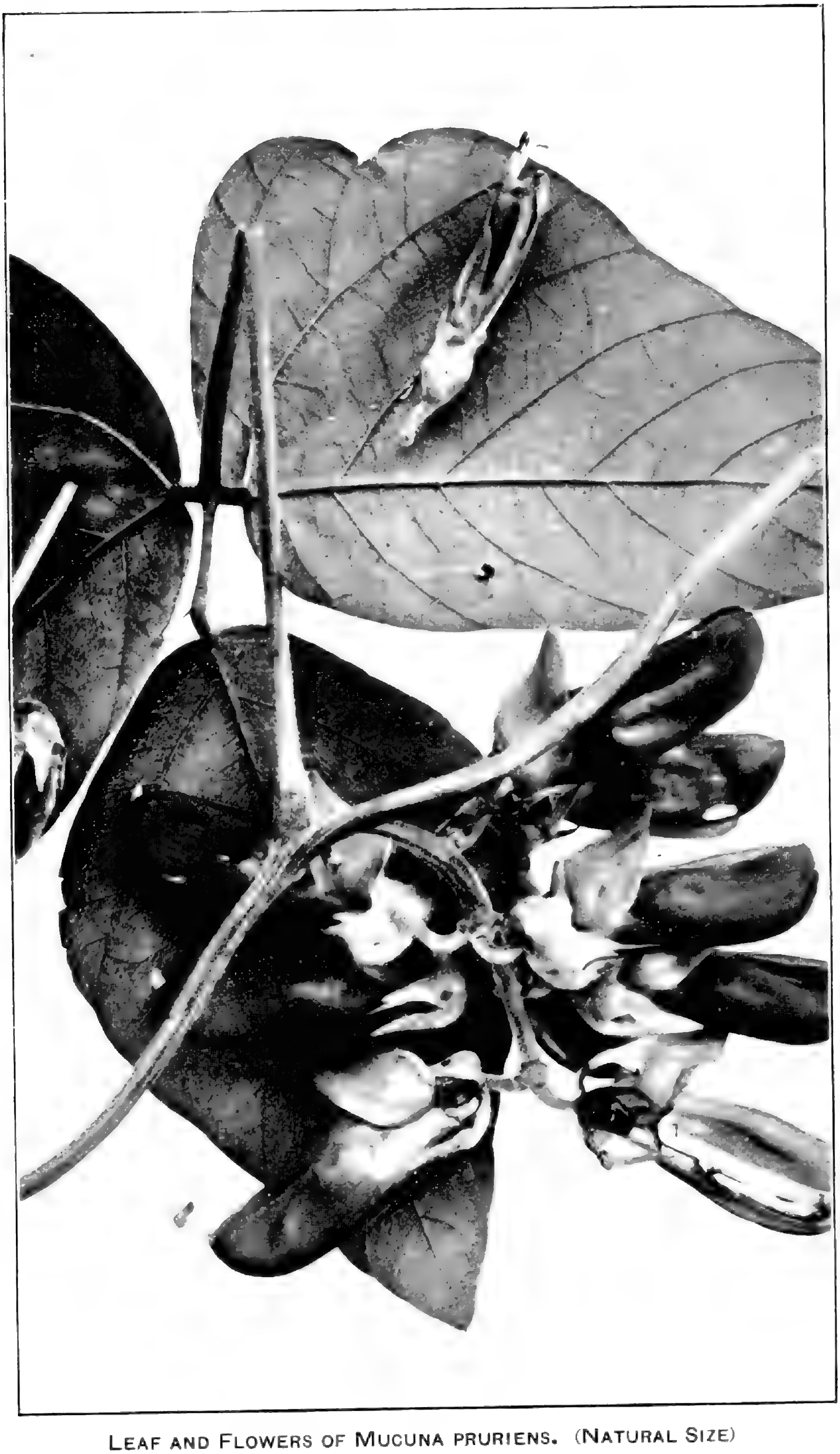

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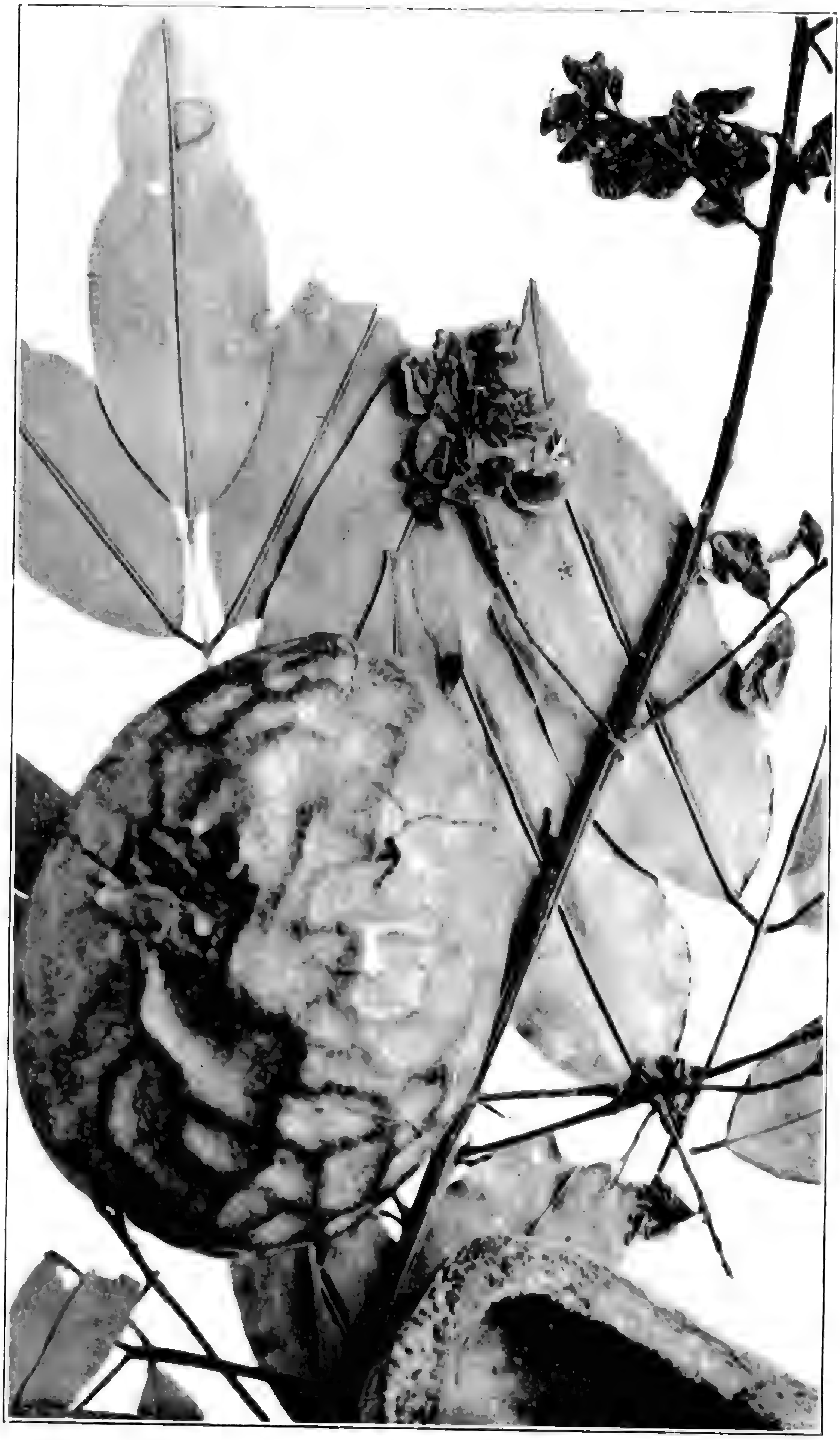

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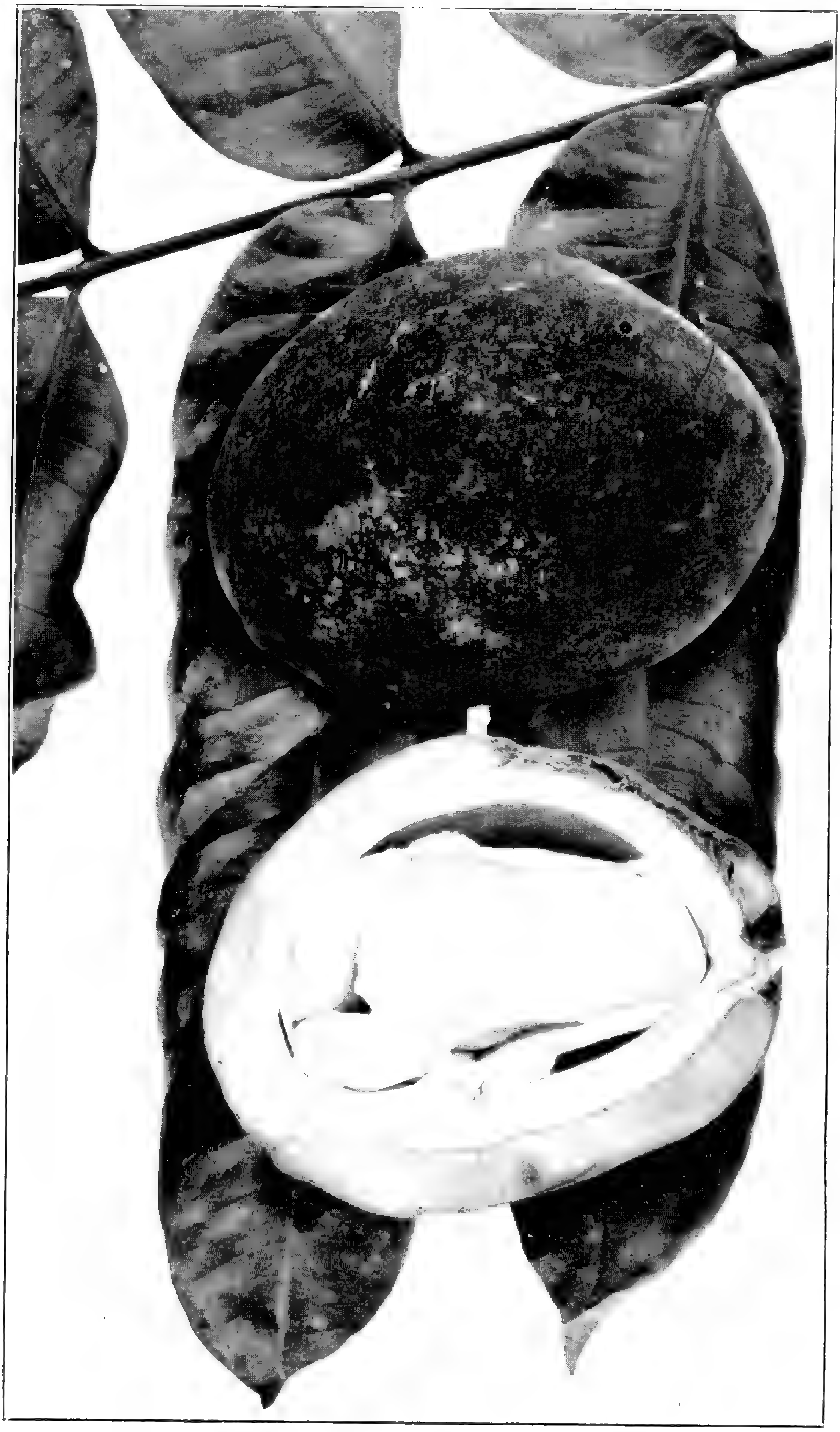

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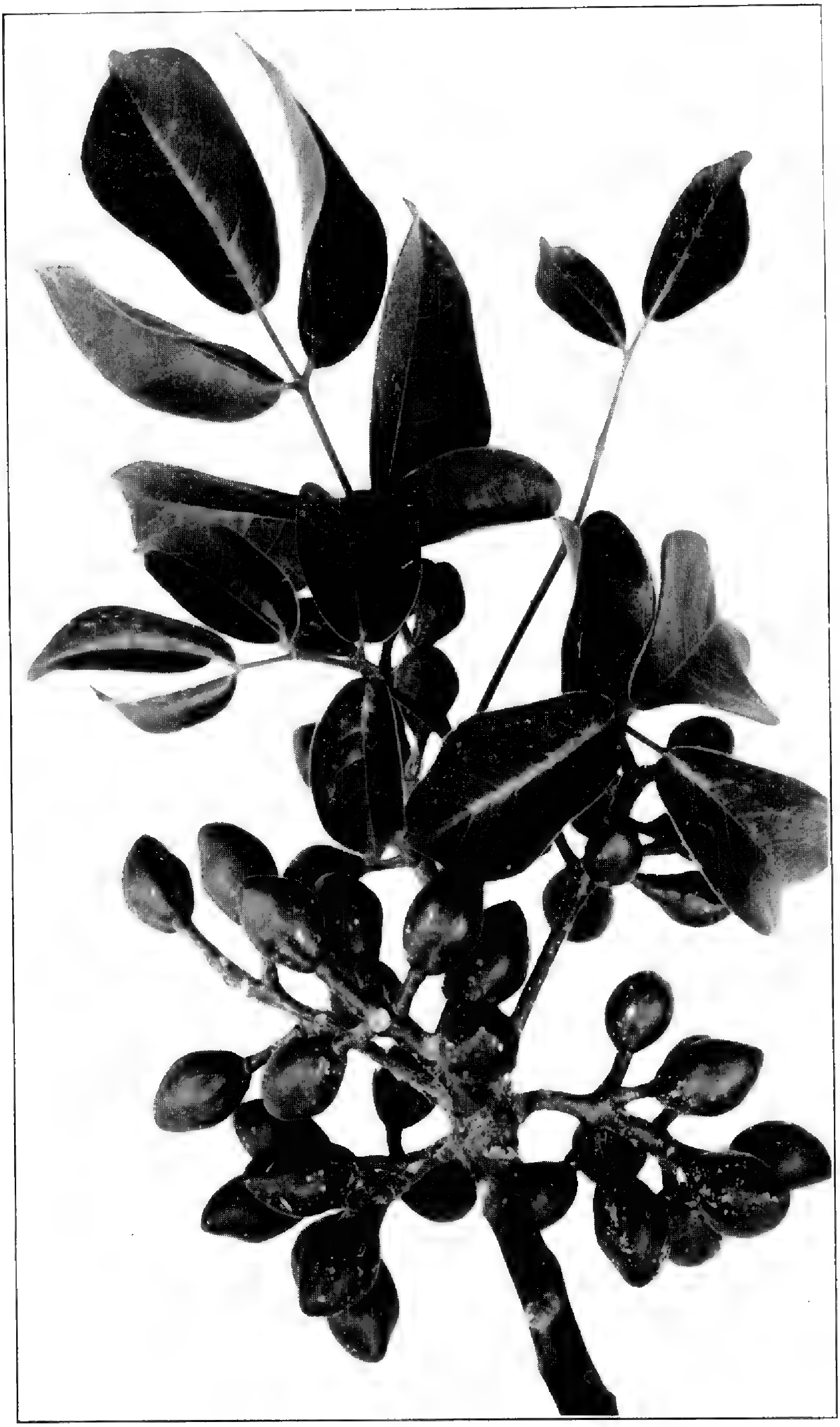

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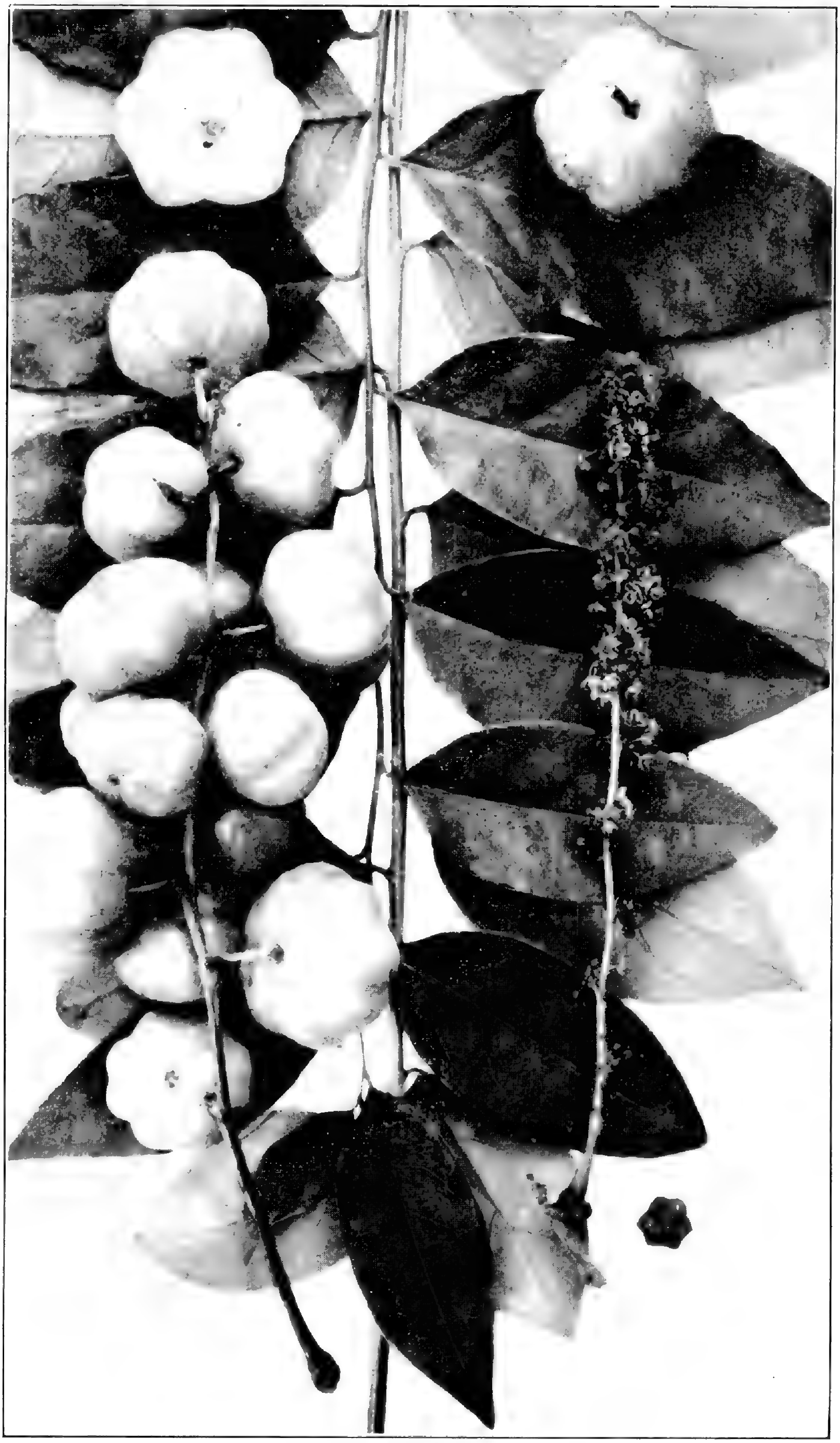

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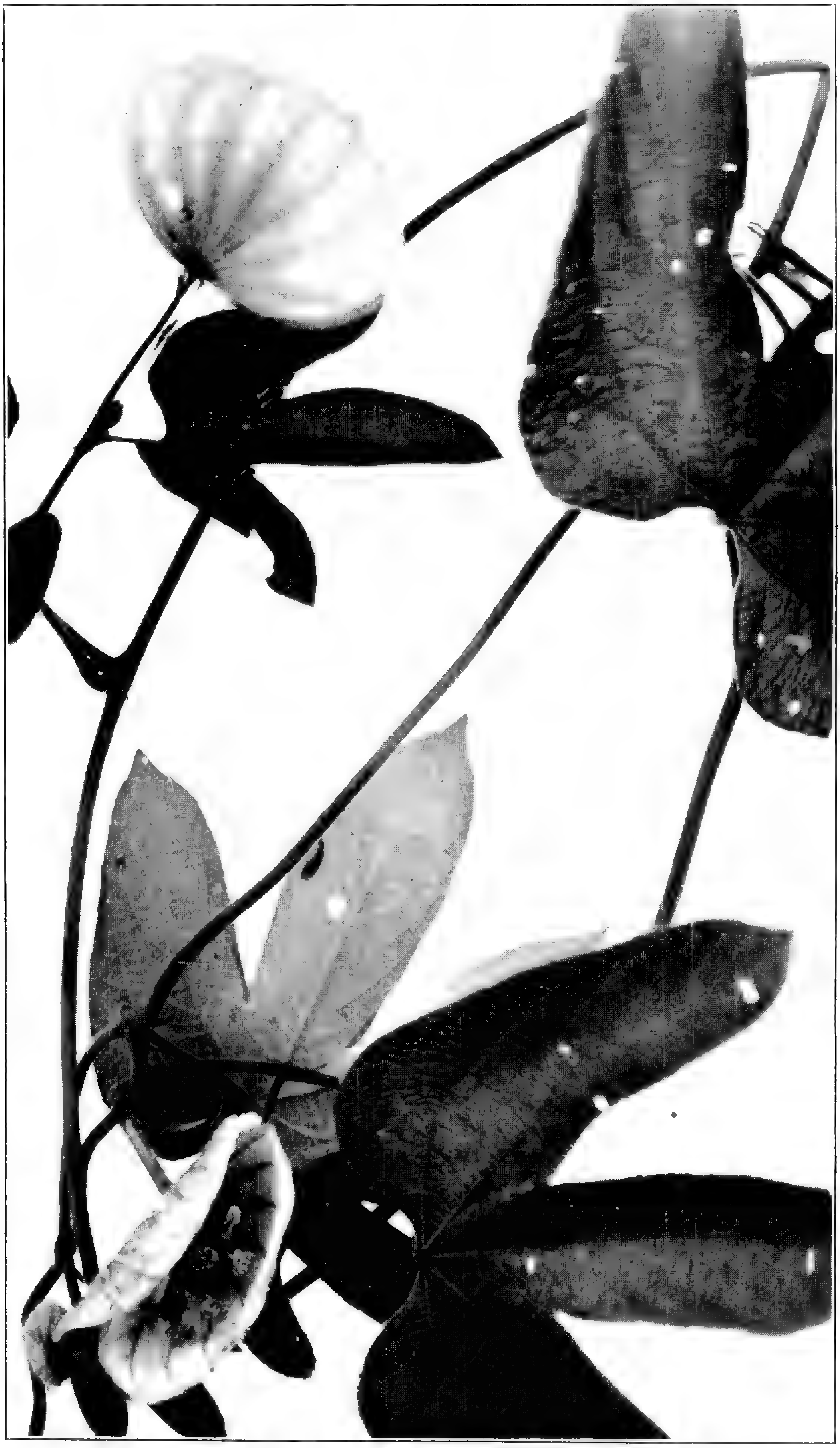

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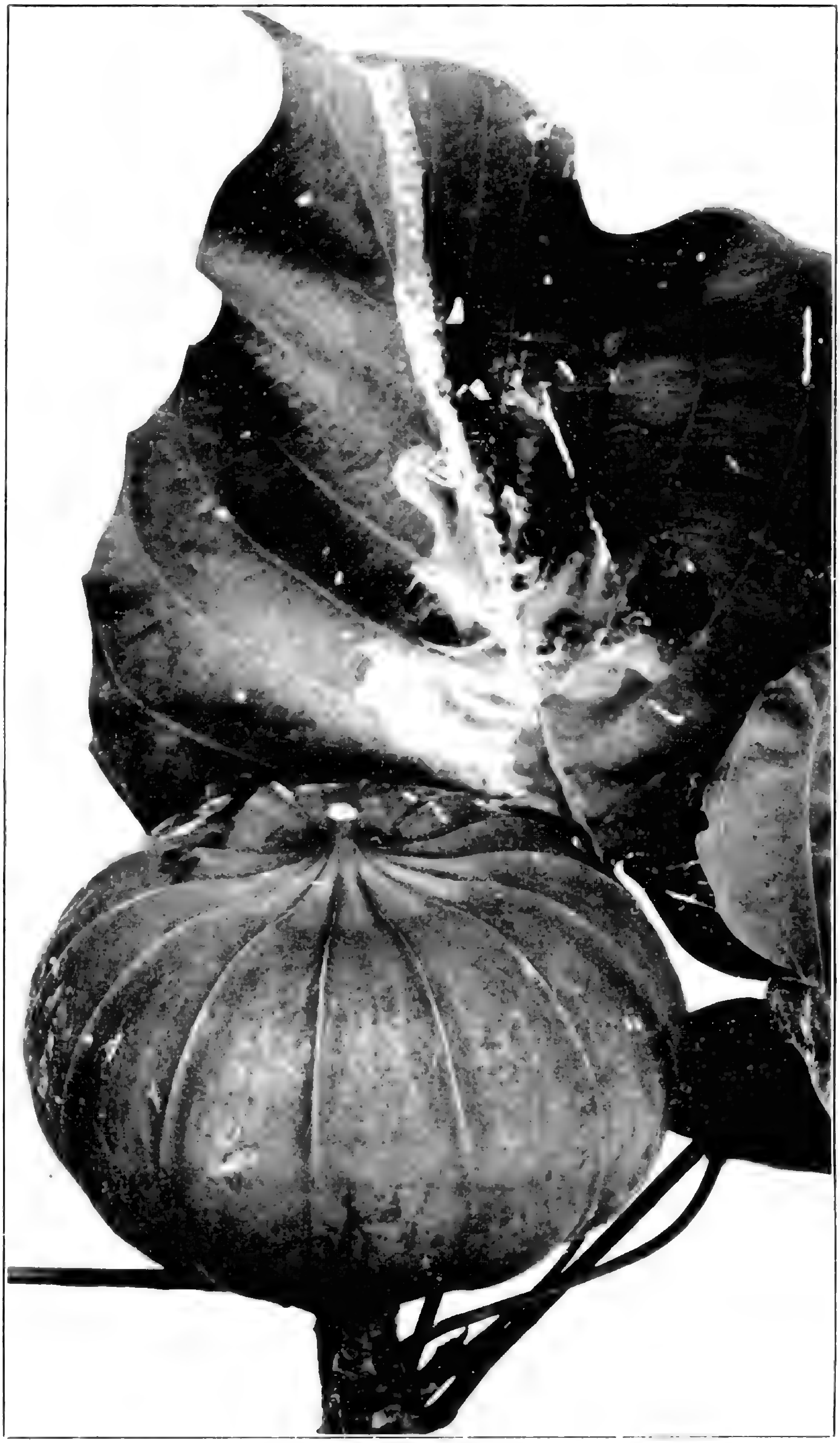

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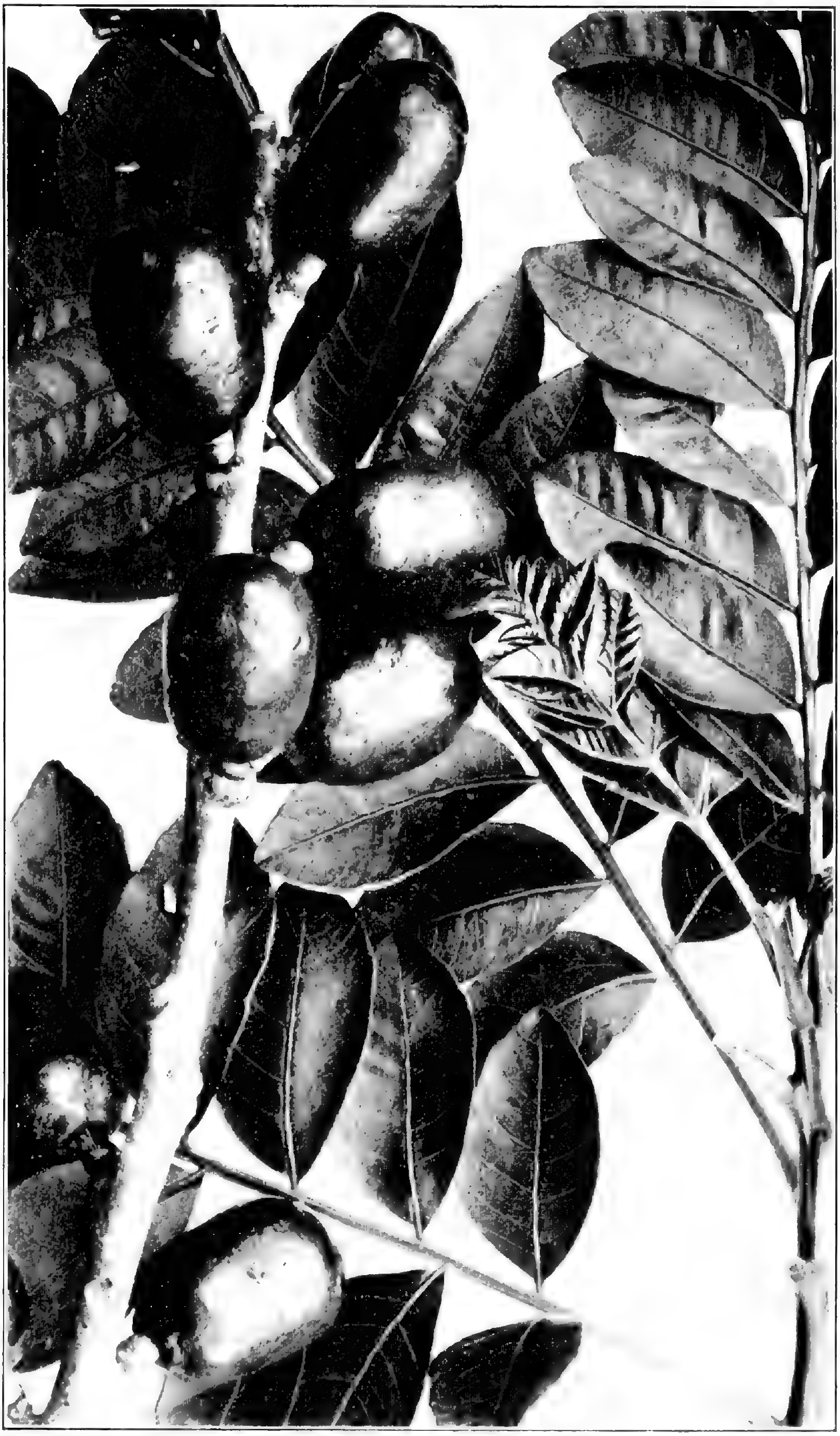

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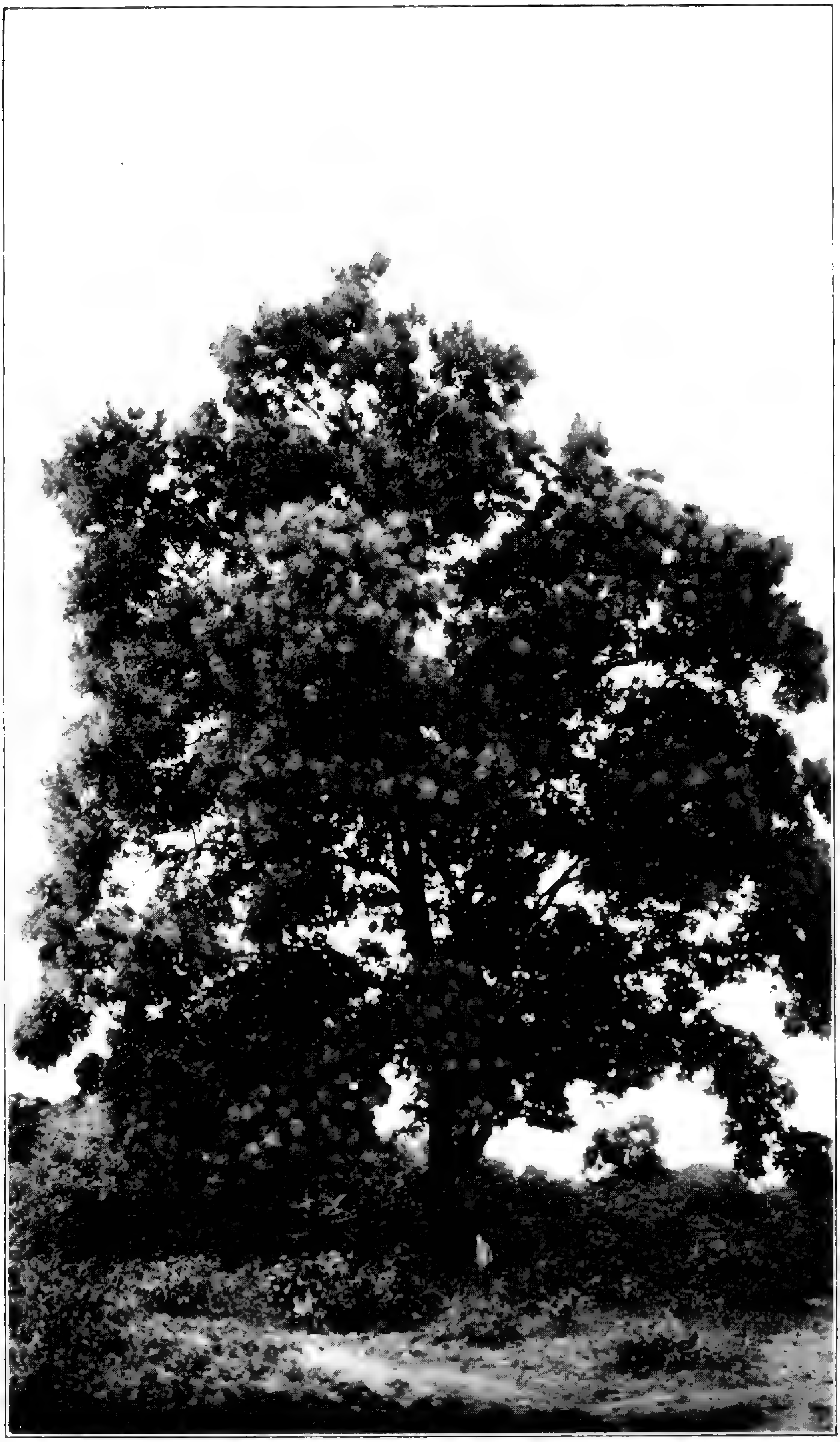

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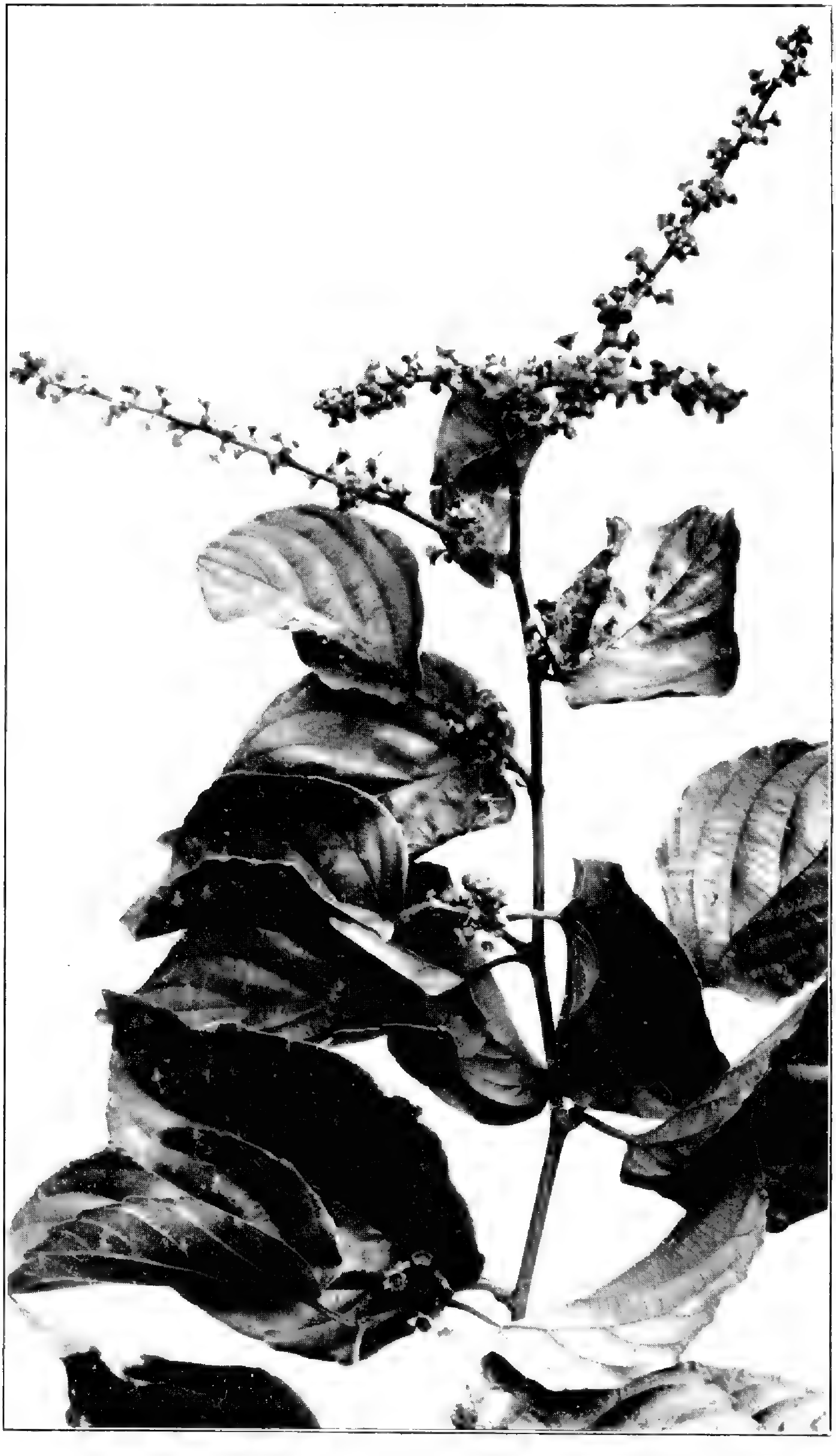
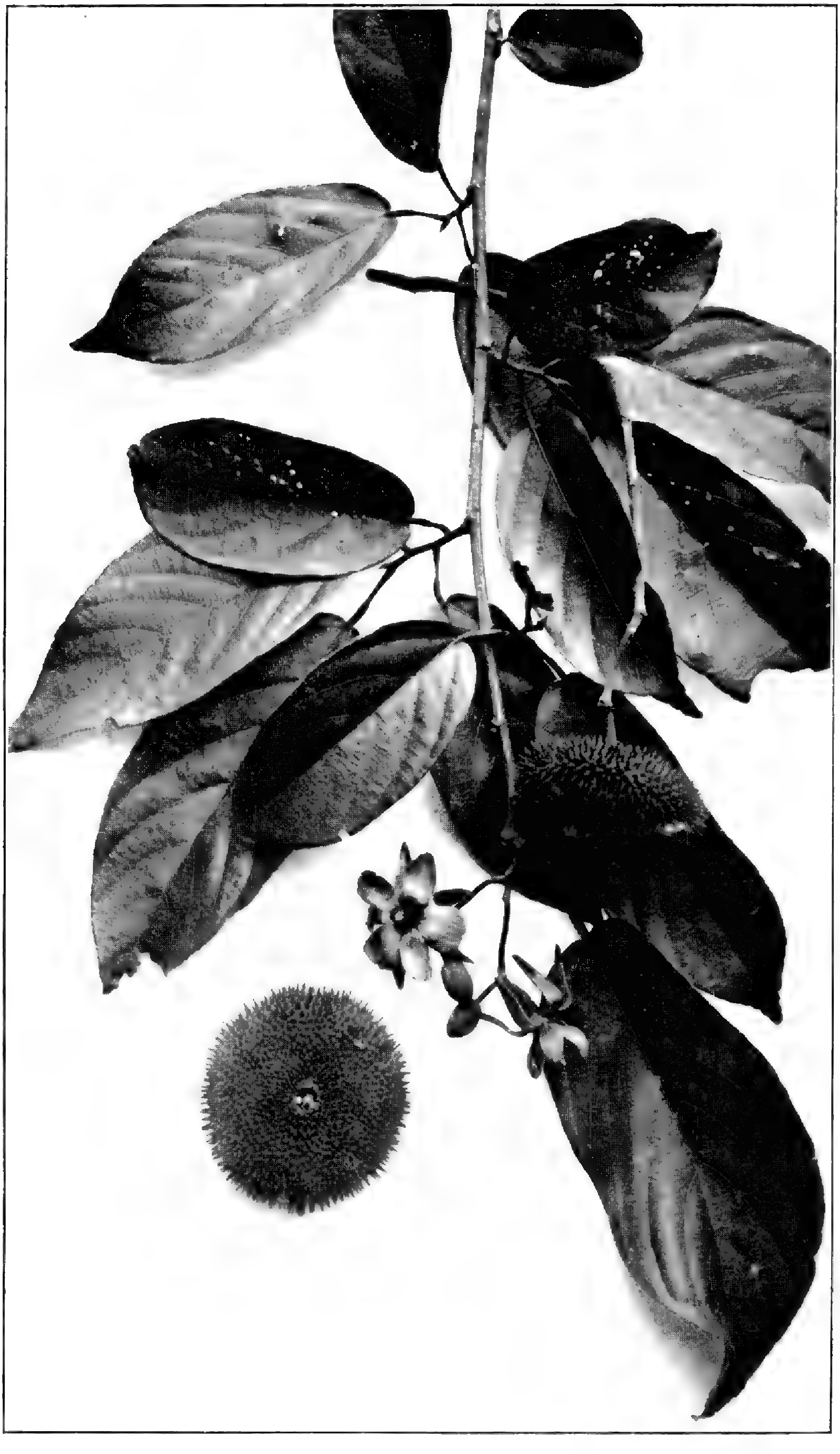
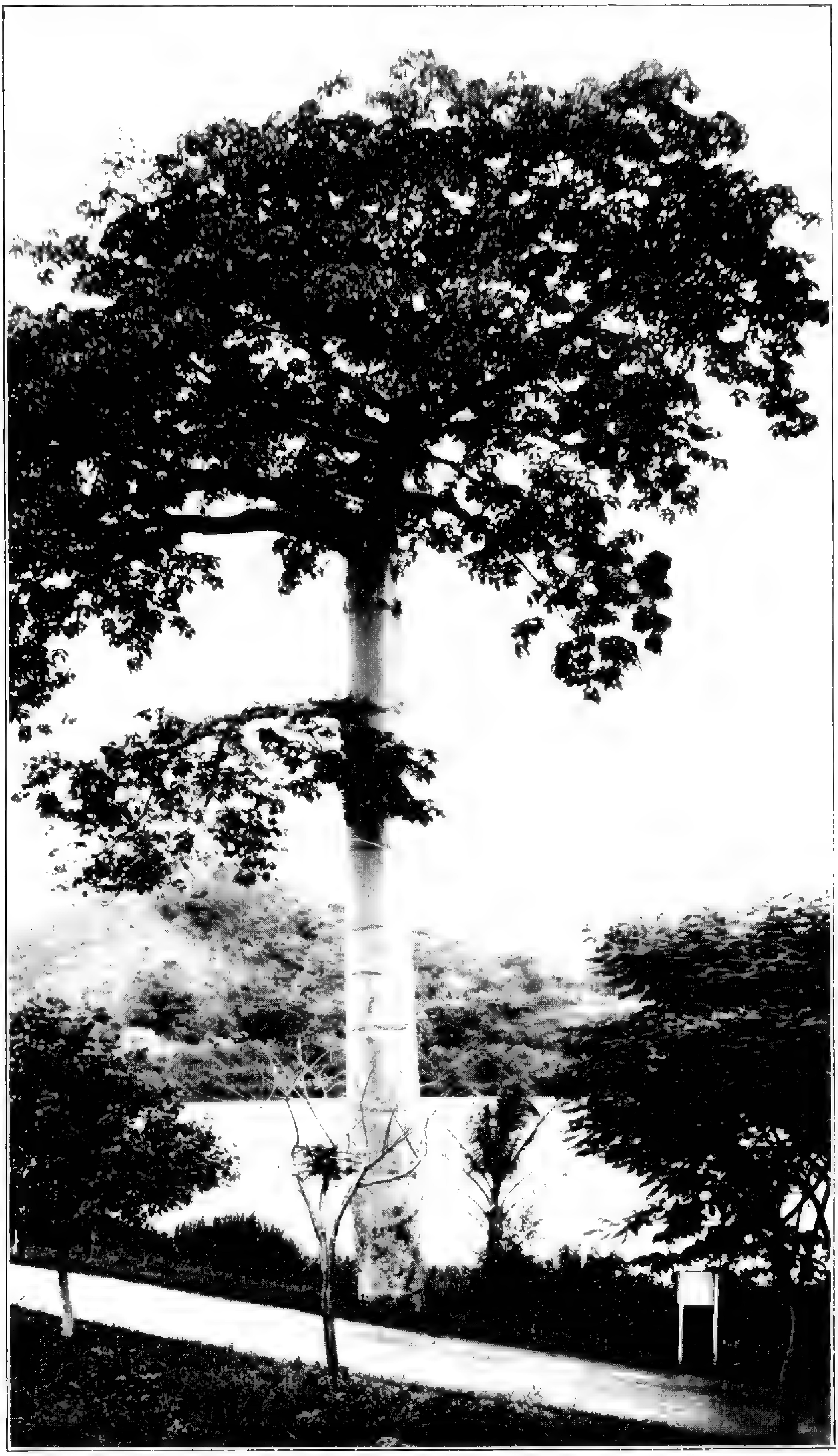


FLOWERING BRANCH OF GOUANIA POLYGAMA. (NATURAL SIZE)



APEIBA ASPERA, WITH FLOWERS AND FRUITS. (ABOUT HALF NATURAL SIZE)



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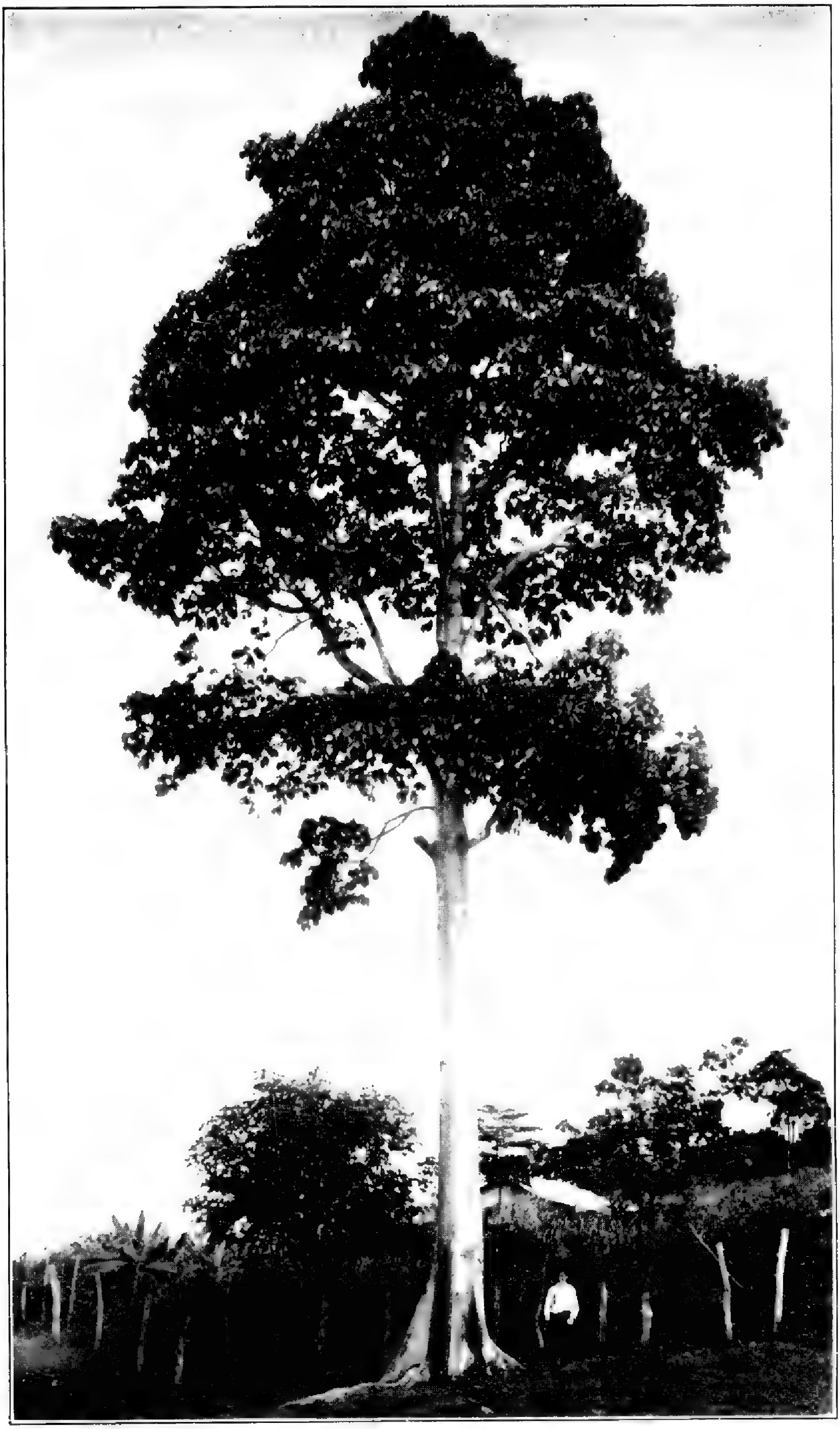
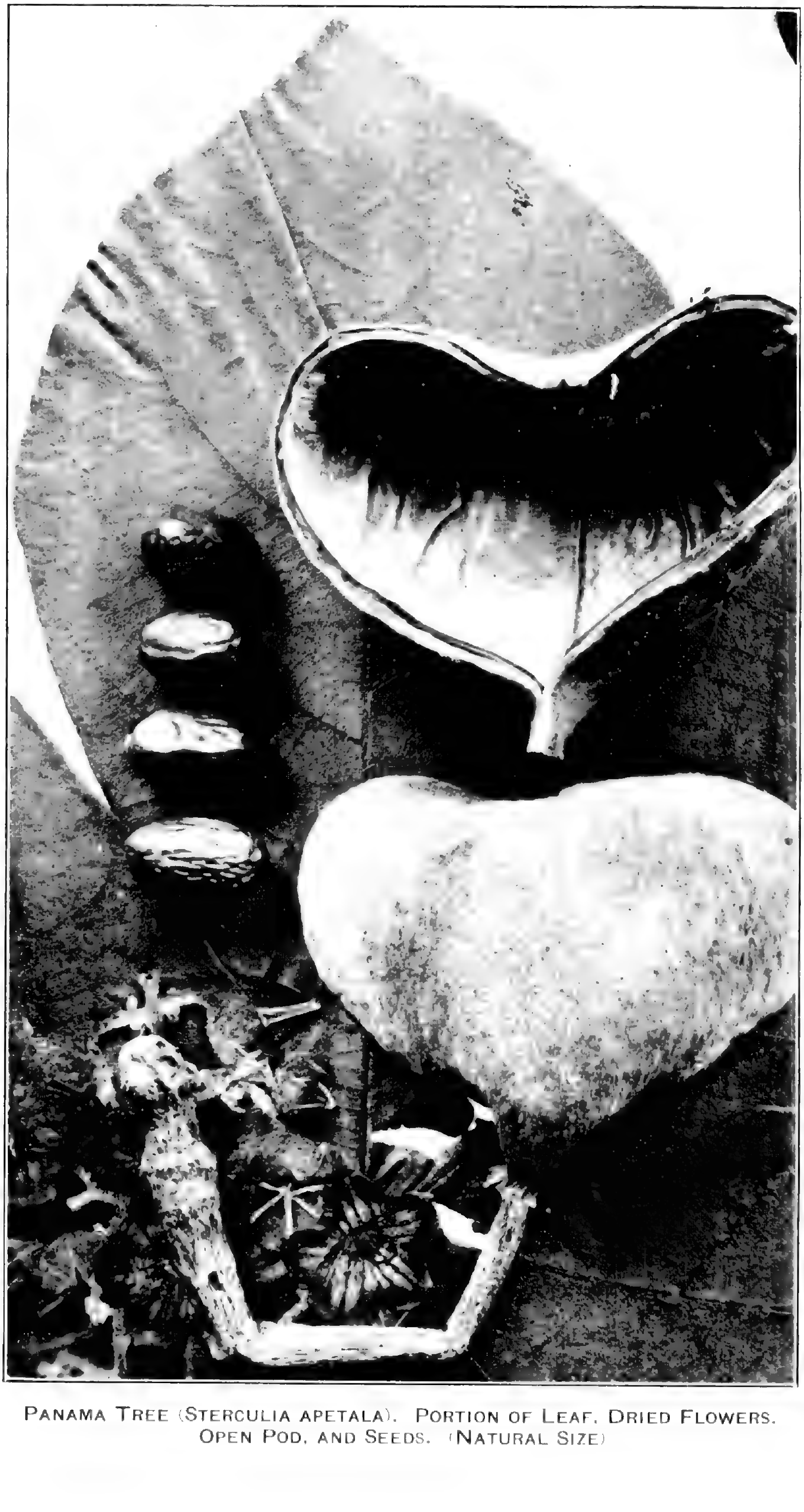
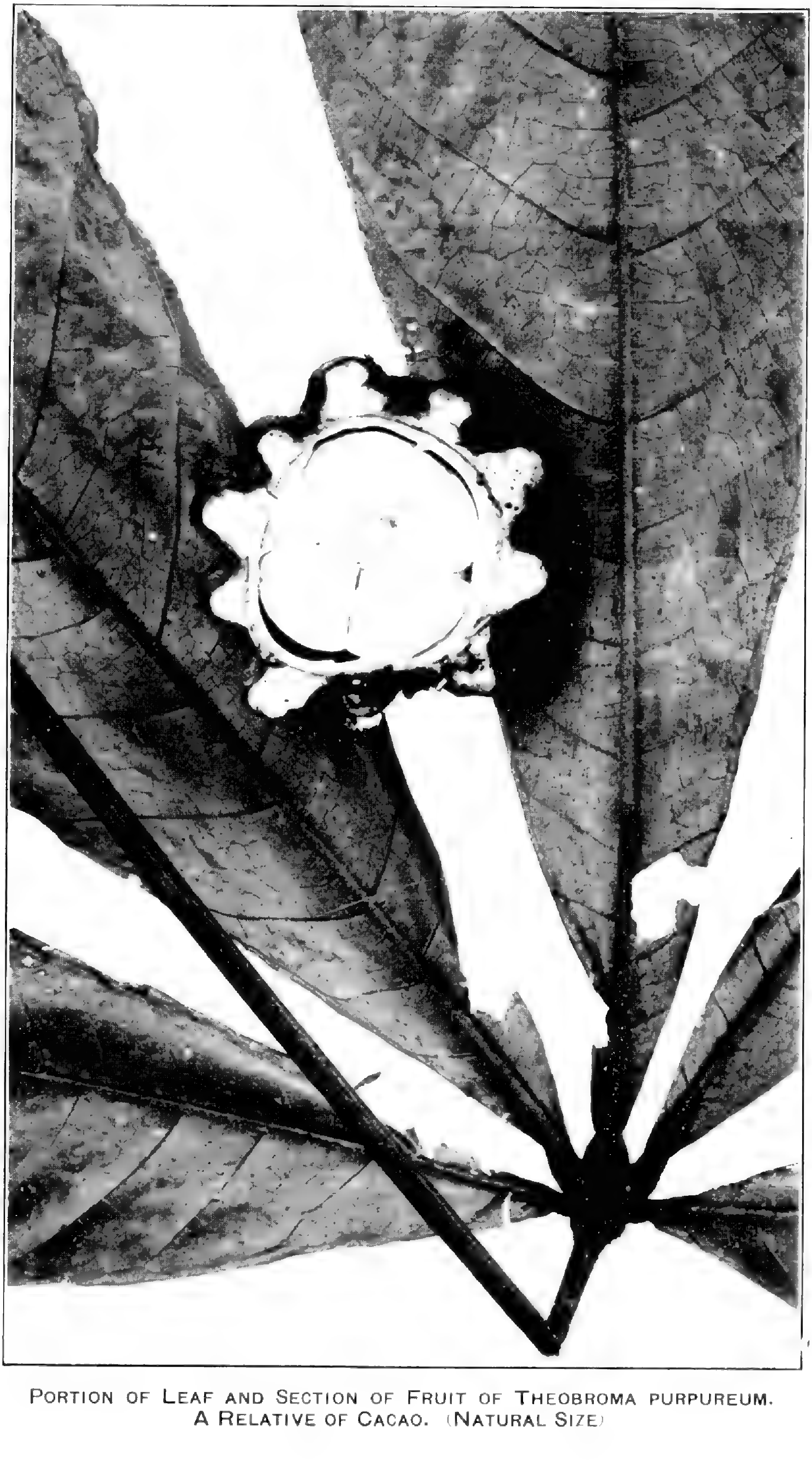


PANAMA TREE (STERCULIA APETALA)

From the Indian name of this tree the Republic of Panama derives its name

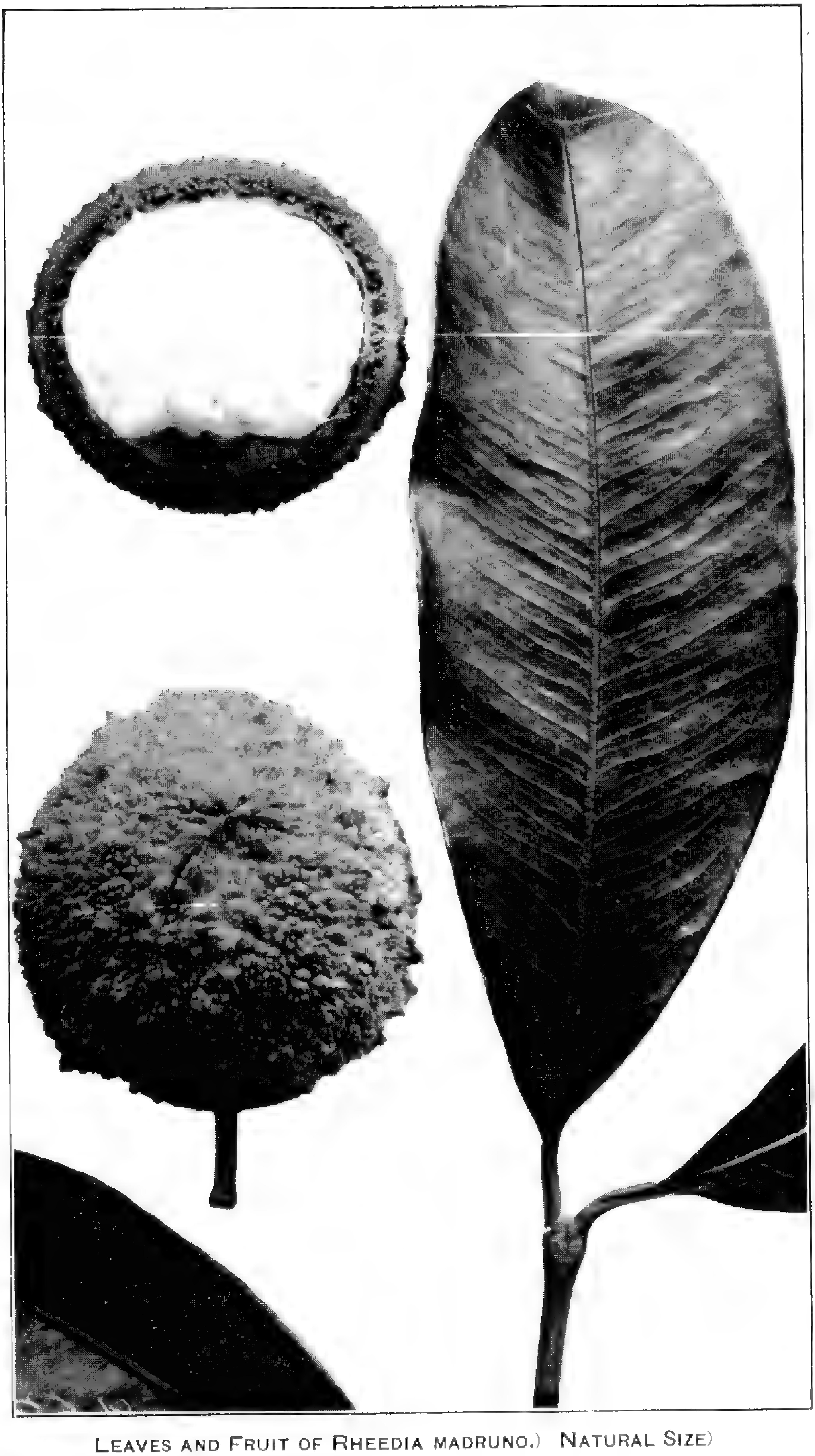


PANAMA TREE (STERCULIA APETALA). PORTION OF LEAF, DRIED FLOWERS, OPEN POD, AND SEEDS. (NATURAL SIZE)

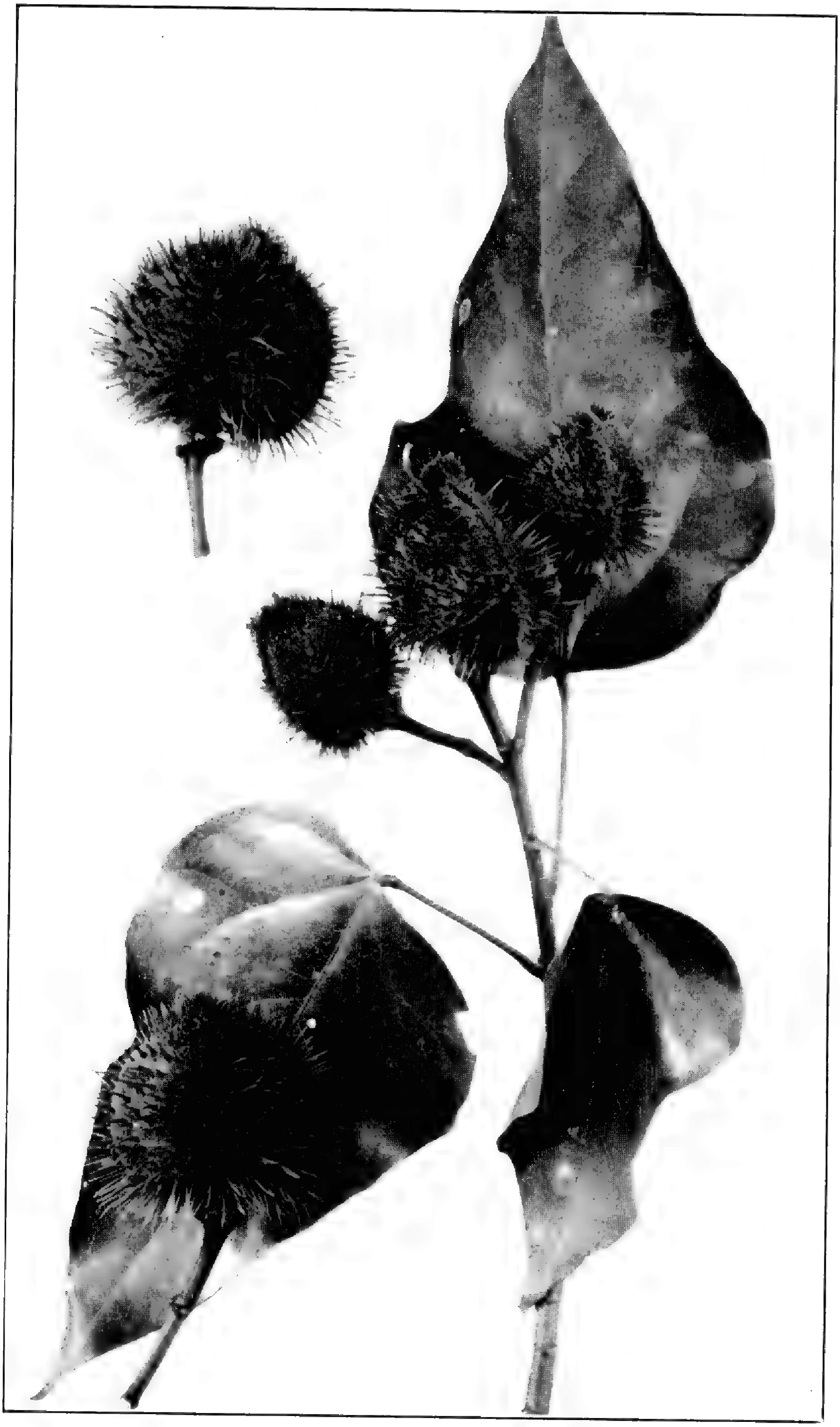


PORTION OF LEAF AND SECTION OF FRUIT OF THEOBROMA PURPUREUM. A RELATIVE OF CACAO. (NATURAL SIZE)

FLOWERING BRANCH OF GUACIMO (GUAZUMA ULMIFOLIA.) (NATURAL SIZE)



LEAVES AND FRUIT OF RHEEDIA MADRUNO.) NATURAL SIZE)



FRUITING BRANCH OF ANATTO (BIXA ORELLANA). AN IMPORTANT DYE PLANT.
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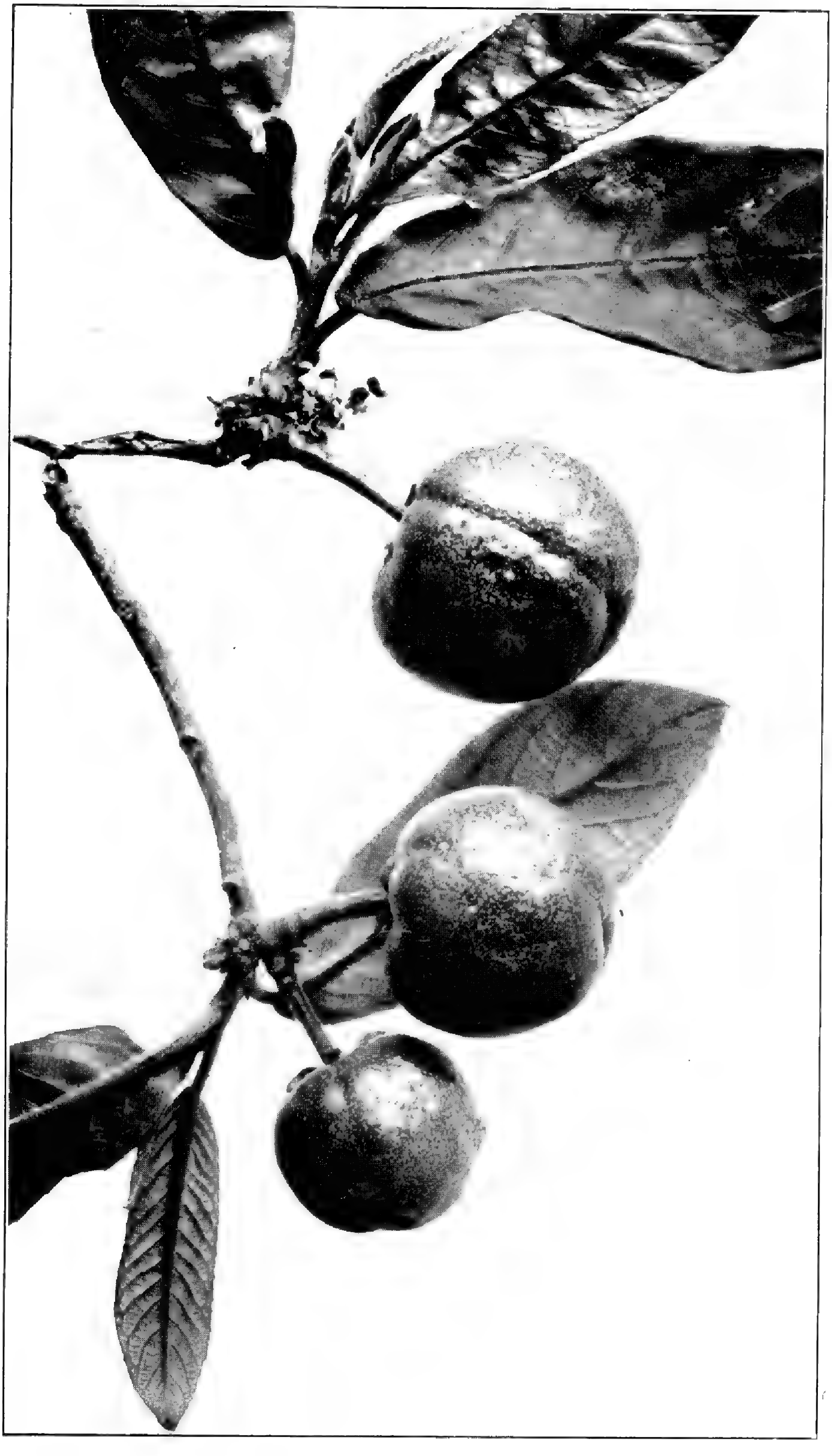
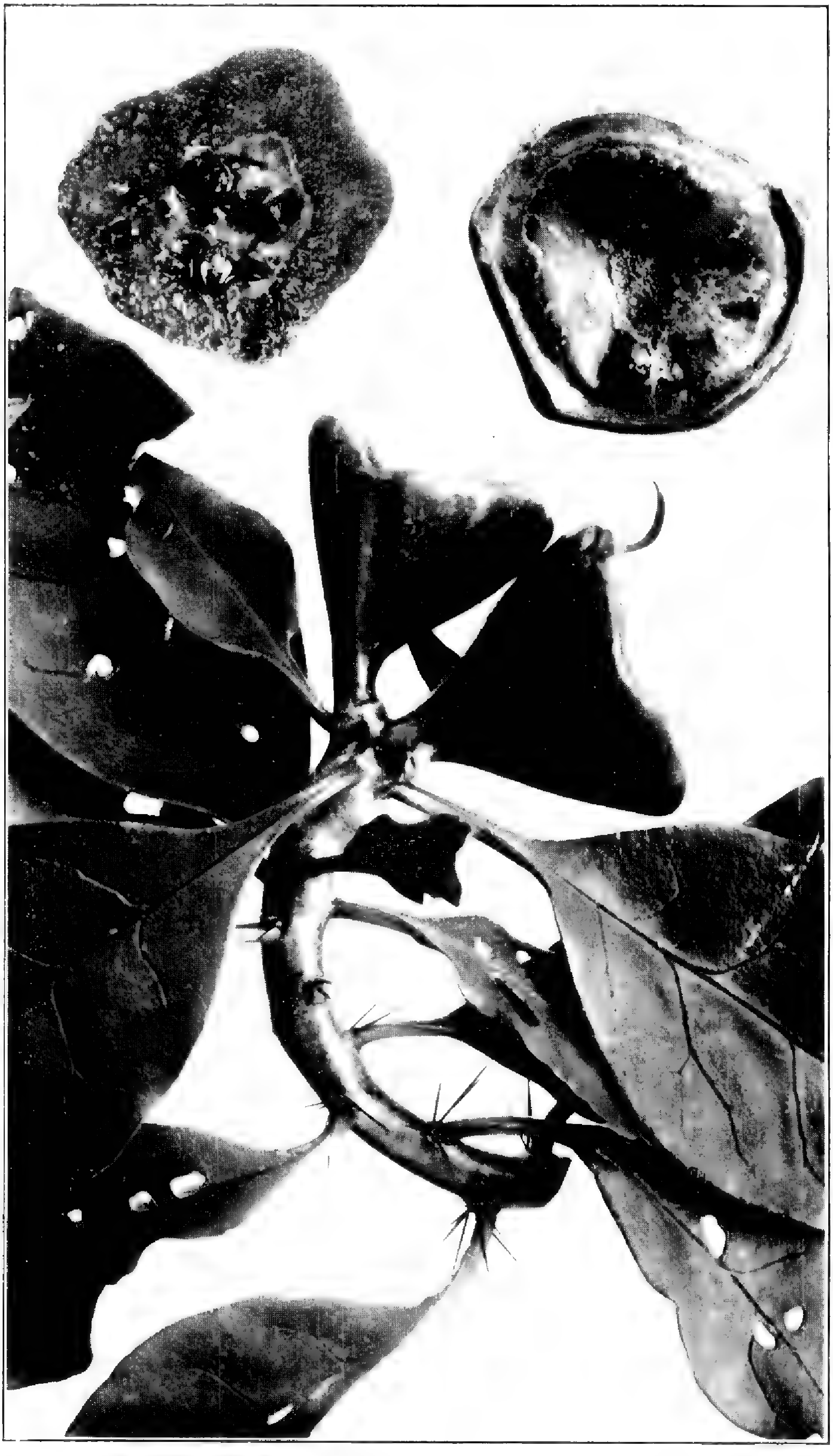
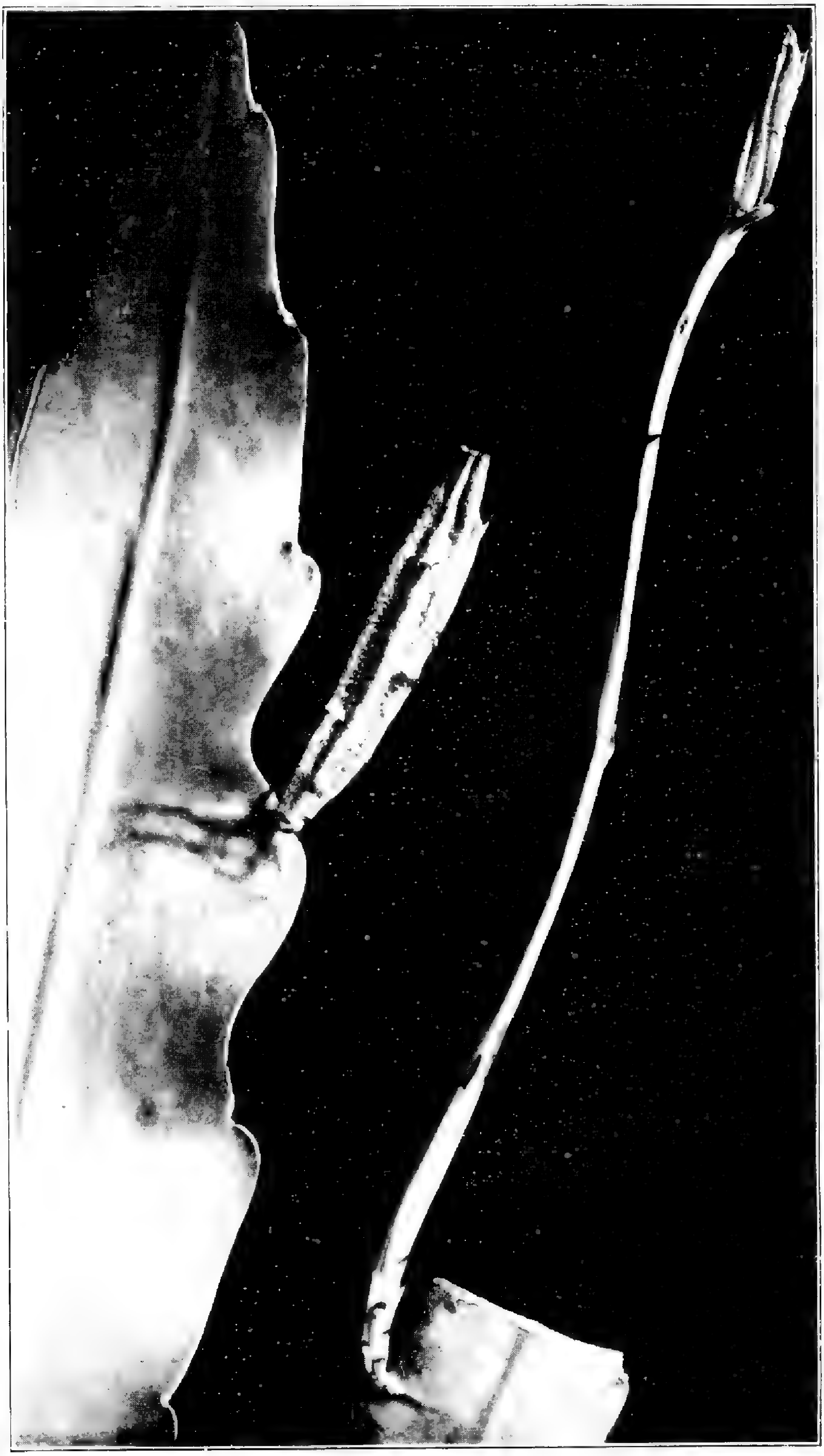


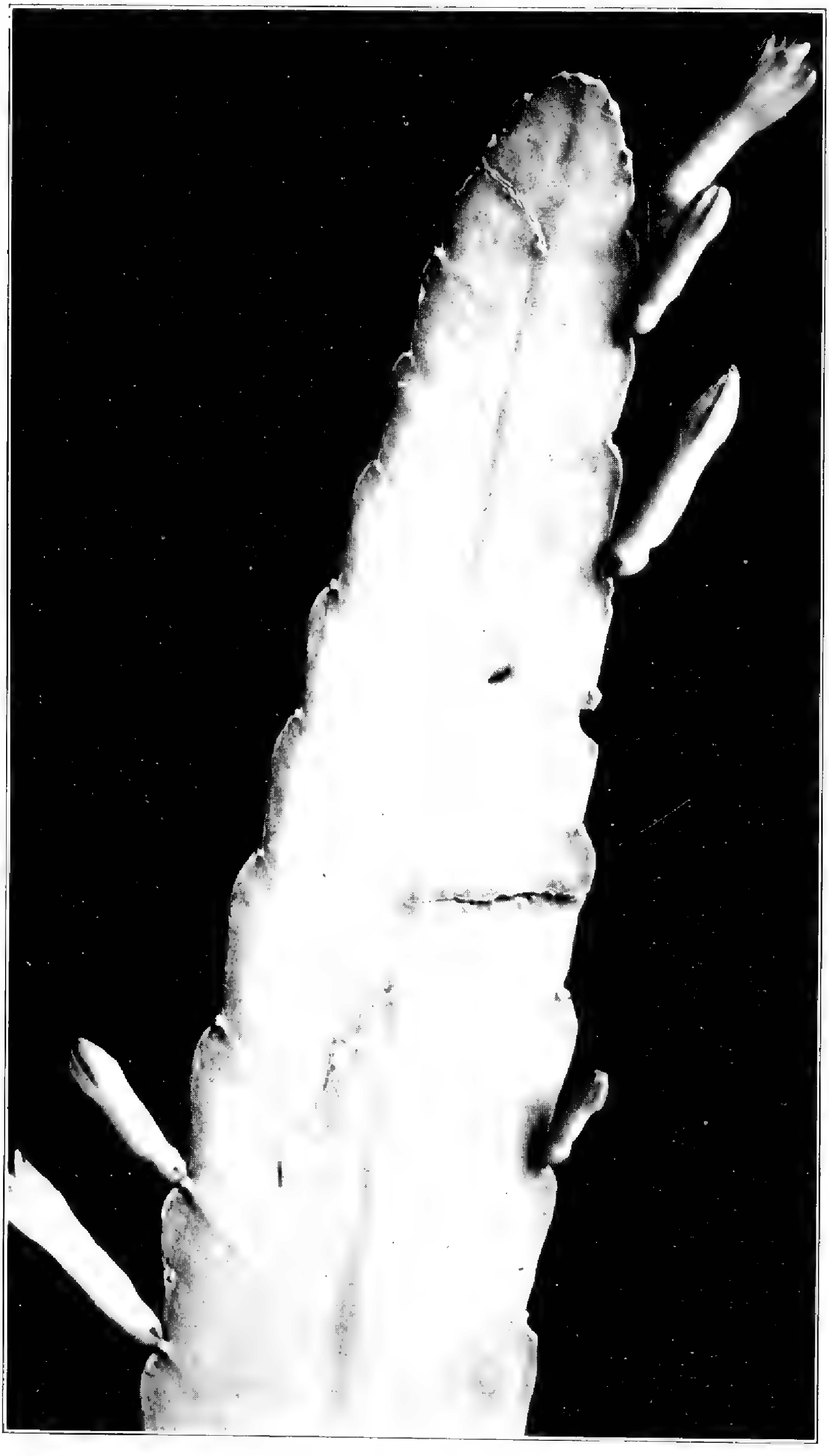
FRUITING BRANCH OF ZUELANIA ROUSSOVIAE. (NATURAL SIZE)



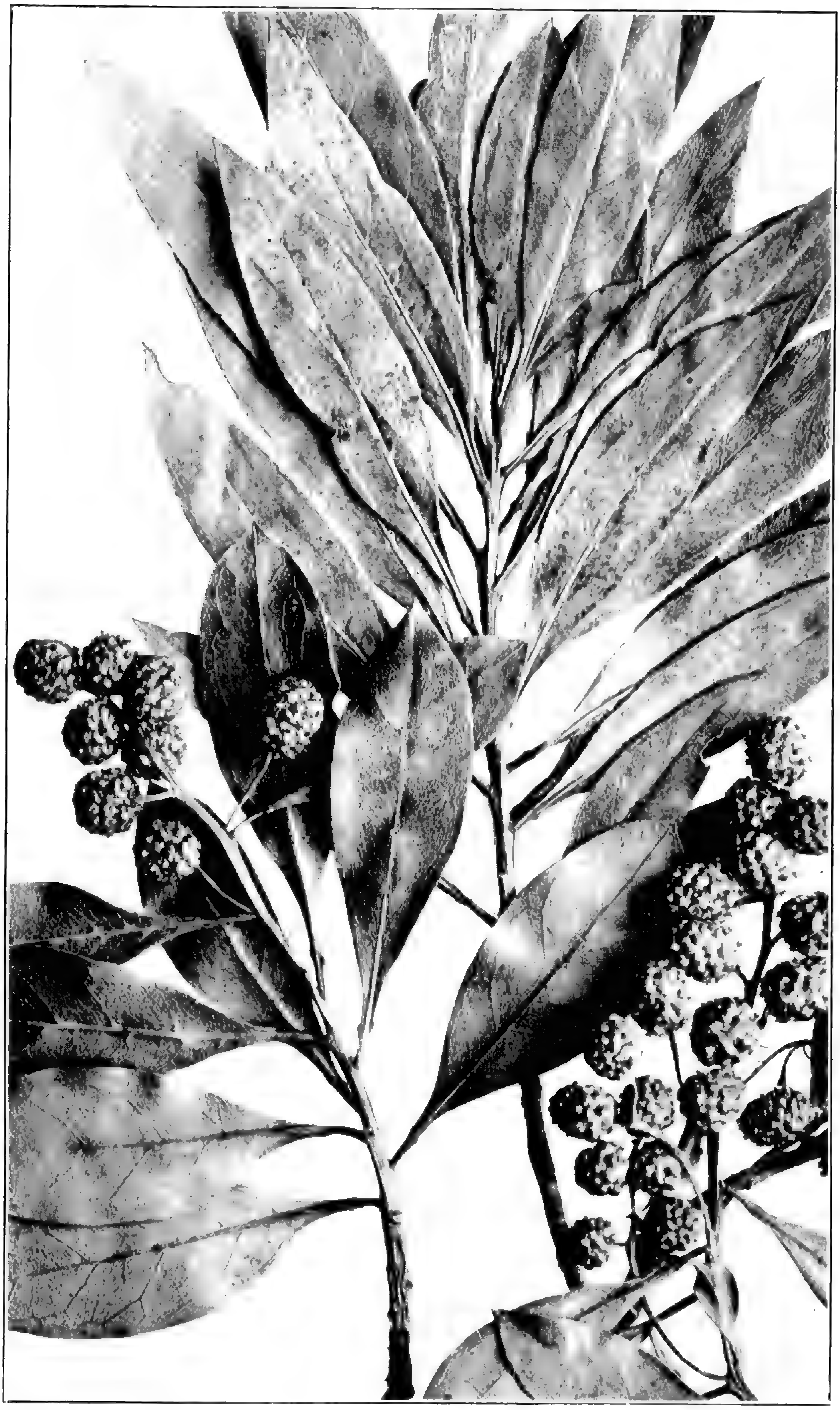
FRUITING BRANCH OF PERESKIA BLEO. A CACTUS. FRUIT YELLOW.
(NATURAL SIZE)



EPIPHYLLUM PHYLLANTHUS. A CACTUS. (FOUR-FIFTHS NATURAL SIZE.)



WITTIA PANAMENSIS. AN EPIPHYTIC CACTUS. (NATURAL SIZE)



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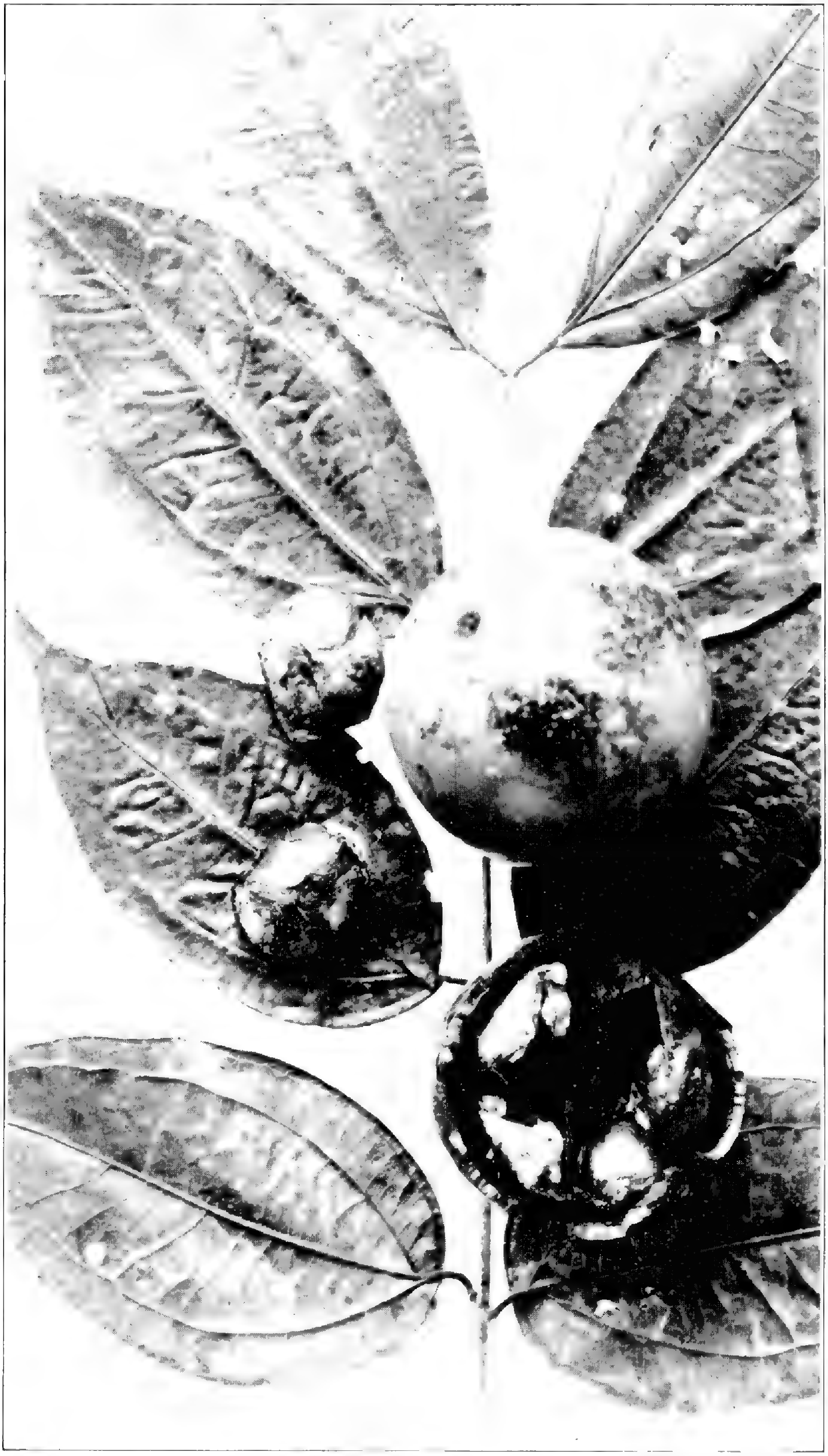
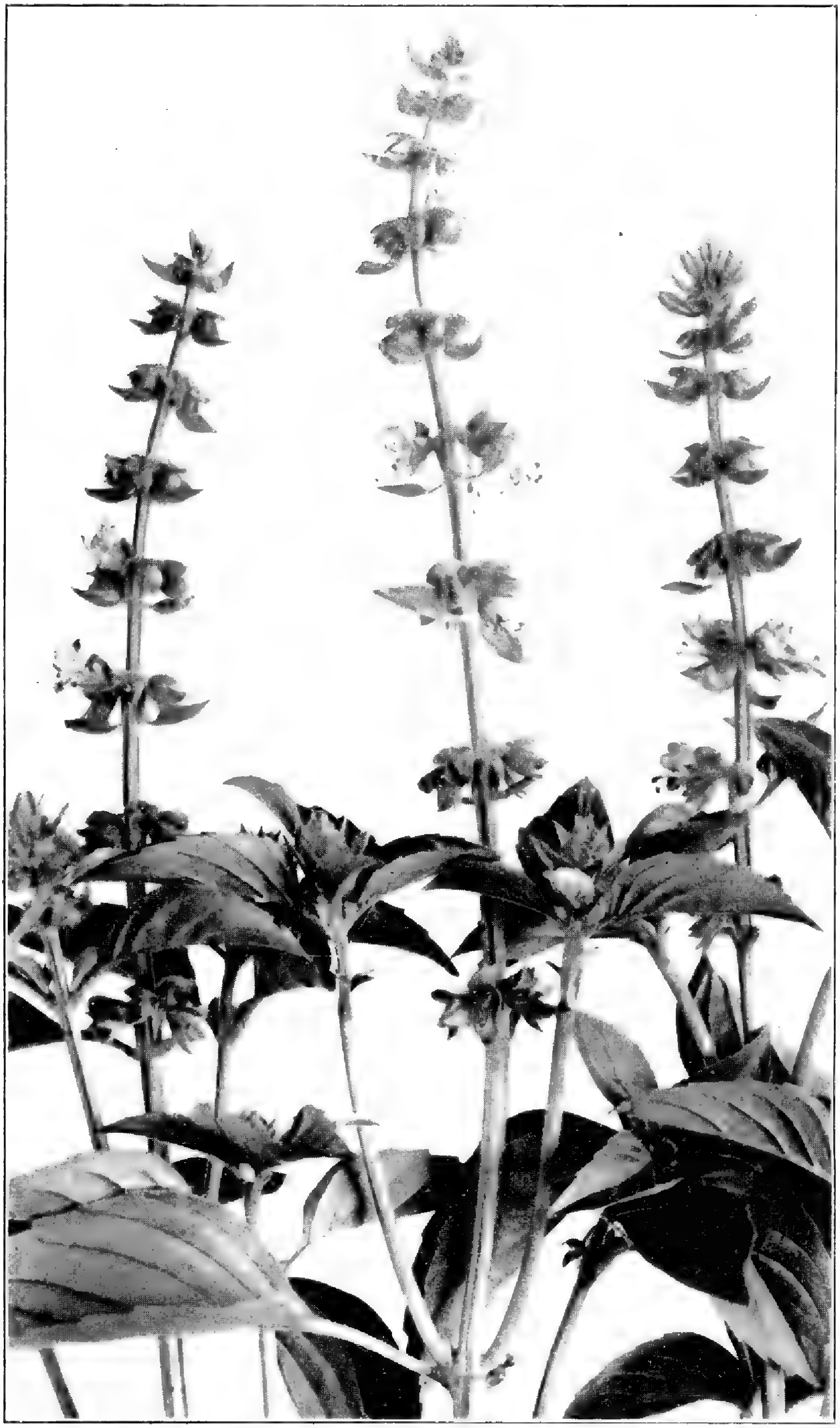


LEAVES AND FRUITS OF STRYCHNOS PANAMENSIS. (HALF NATURAL SIZE)



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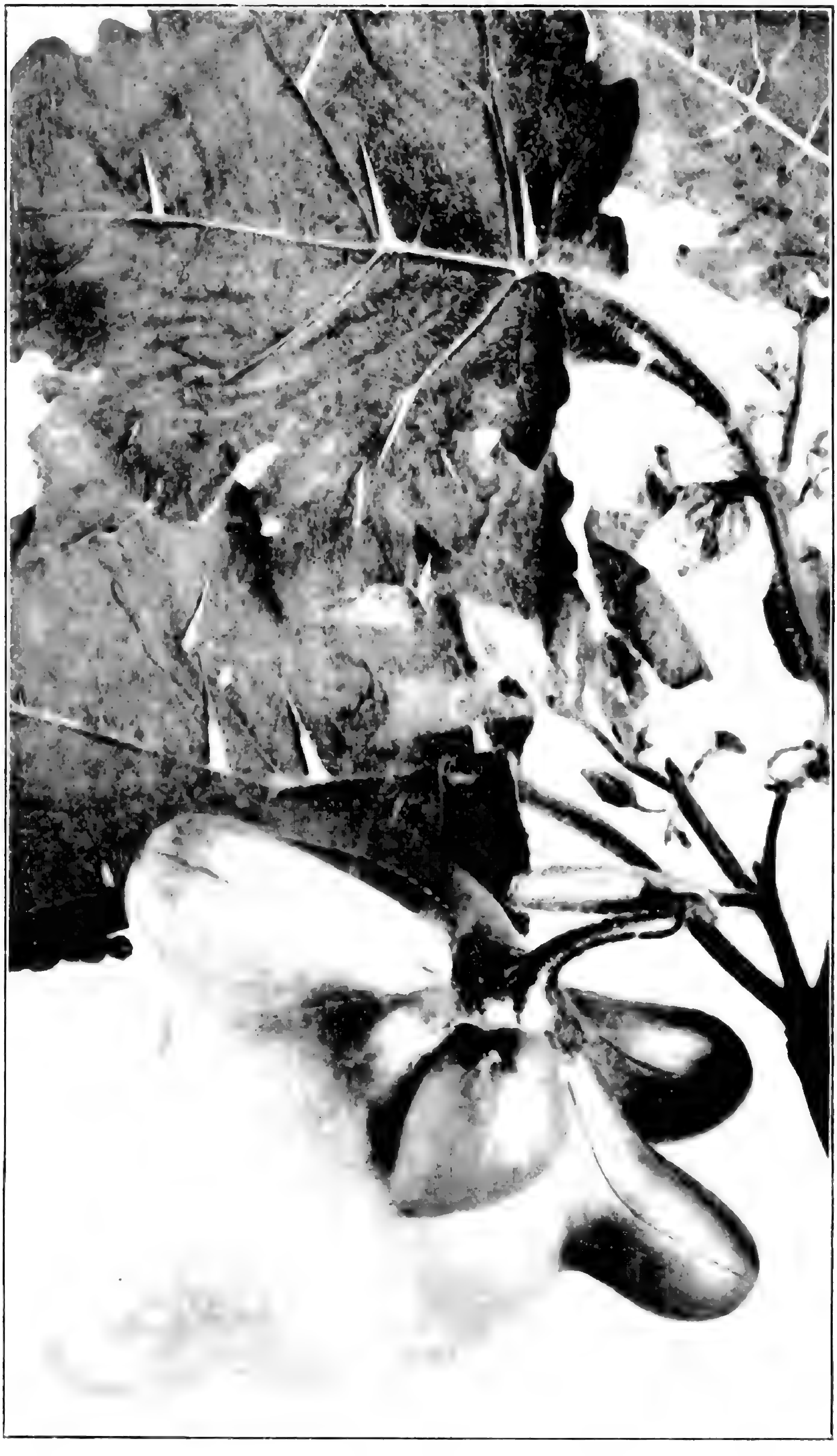
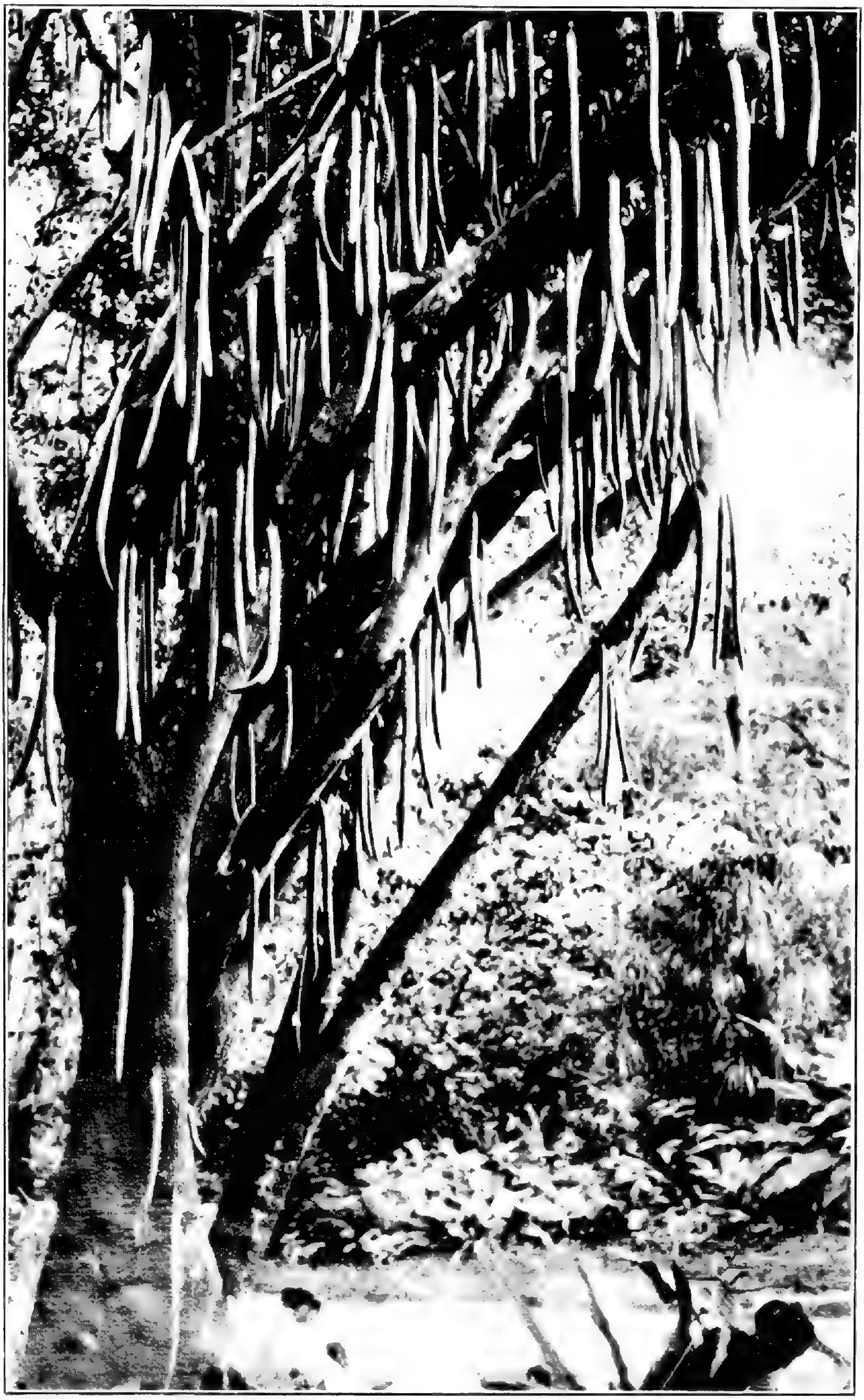


SOLANUM MAMMOSUM, WITH MATURE FRUIT. FRUIT YELLOW. (NATURAL SIZE)



CANDLETREE (PARMENTIERA CEREIFERA)

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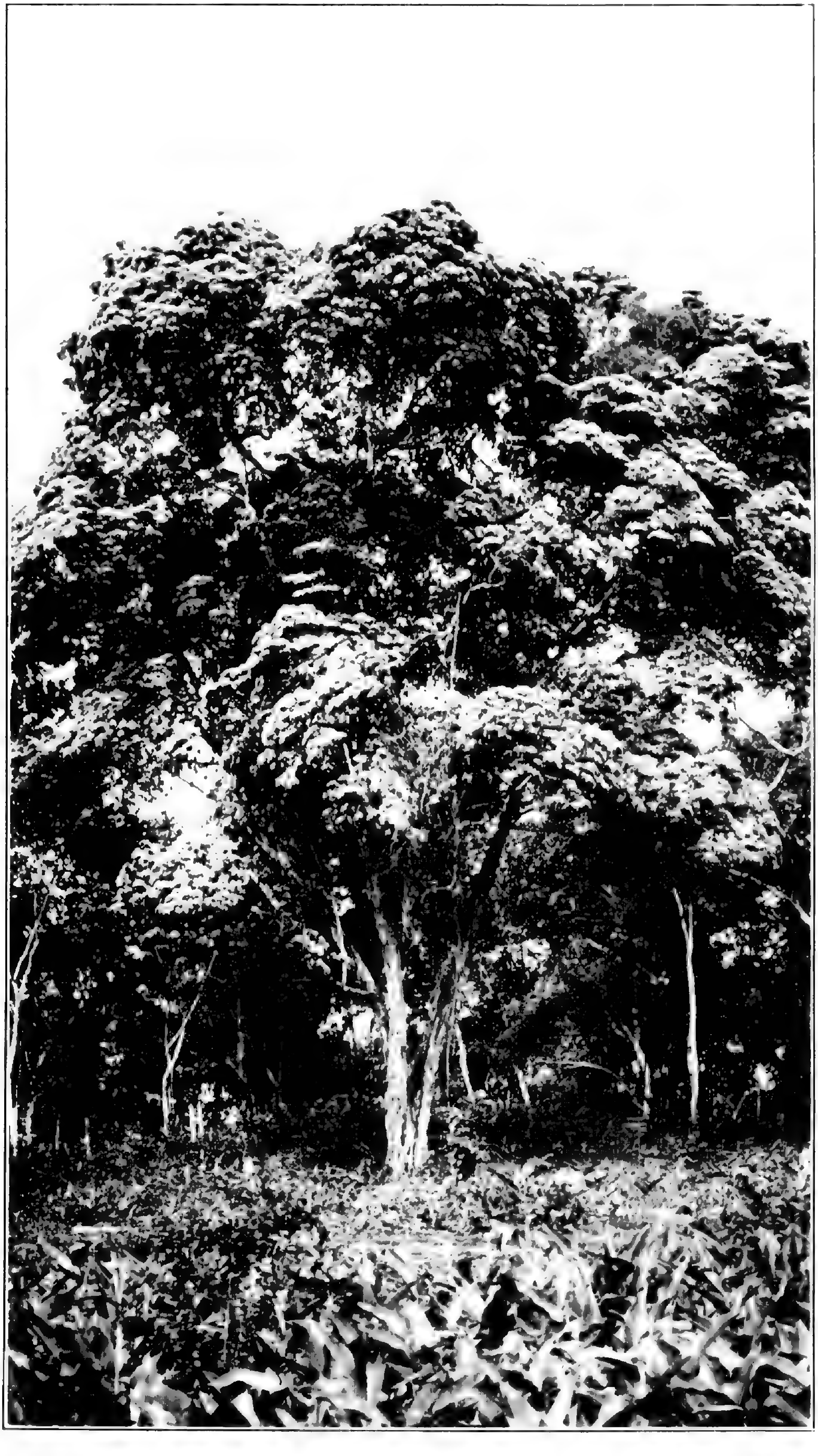
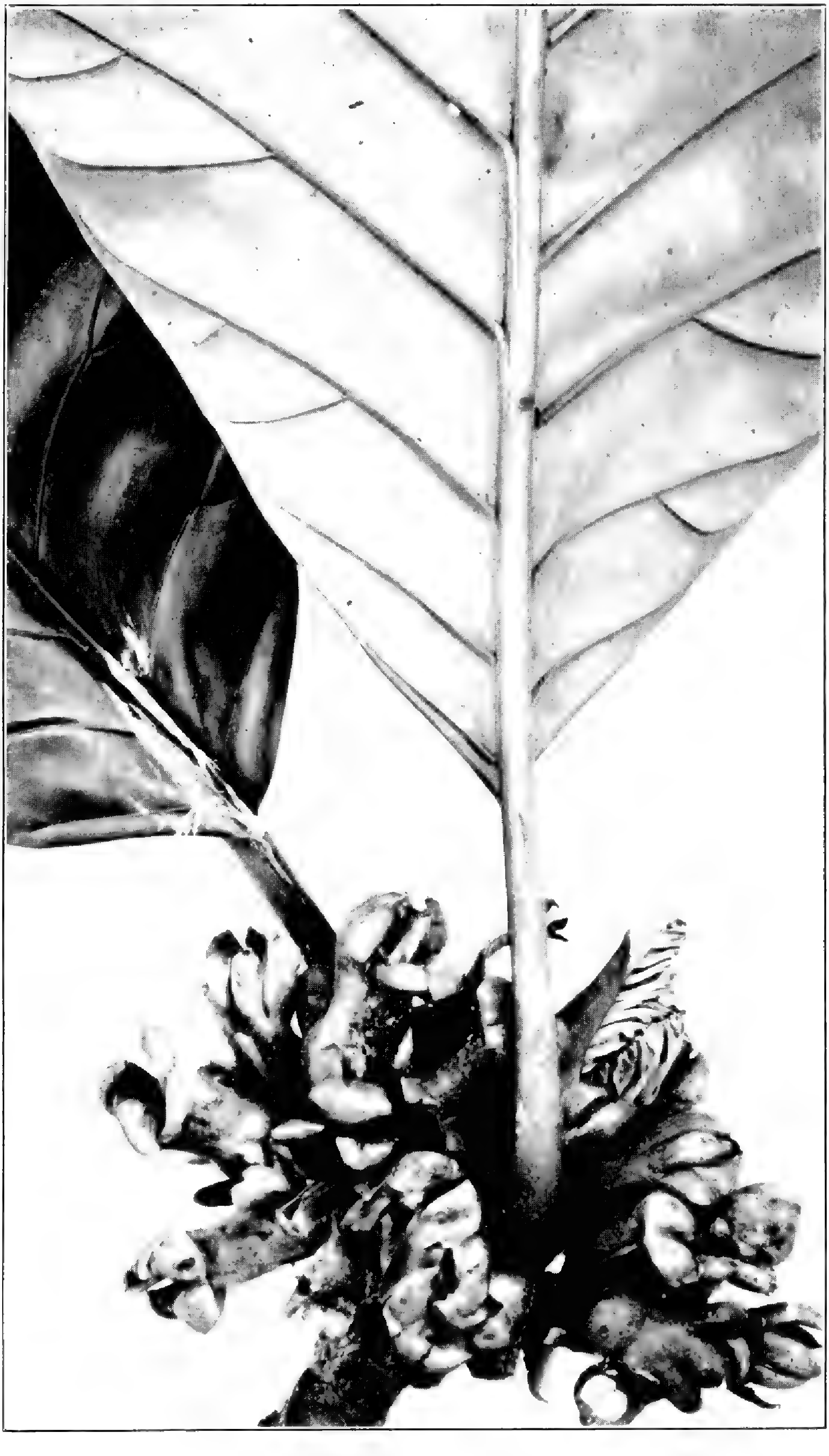
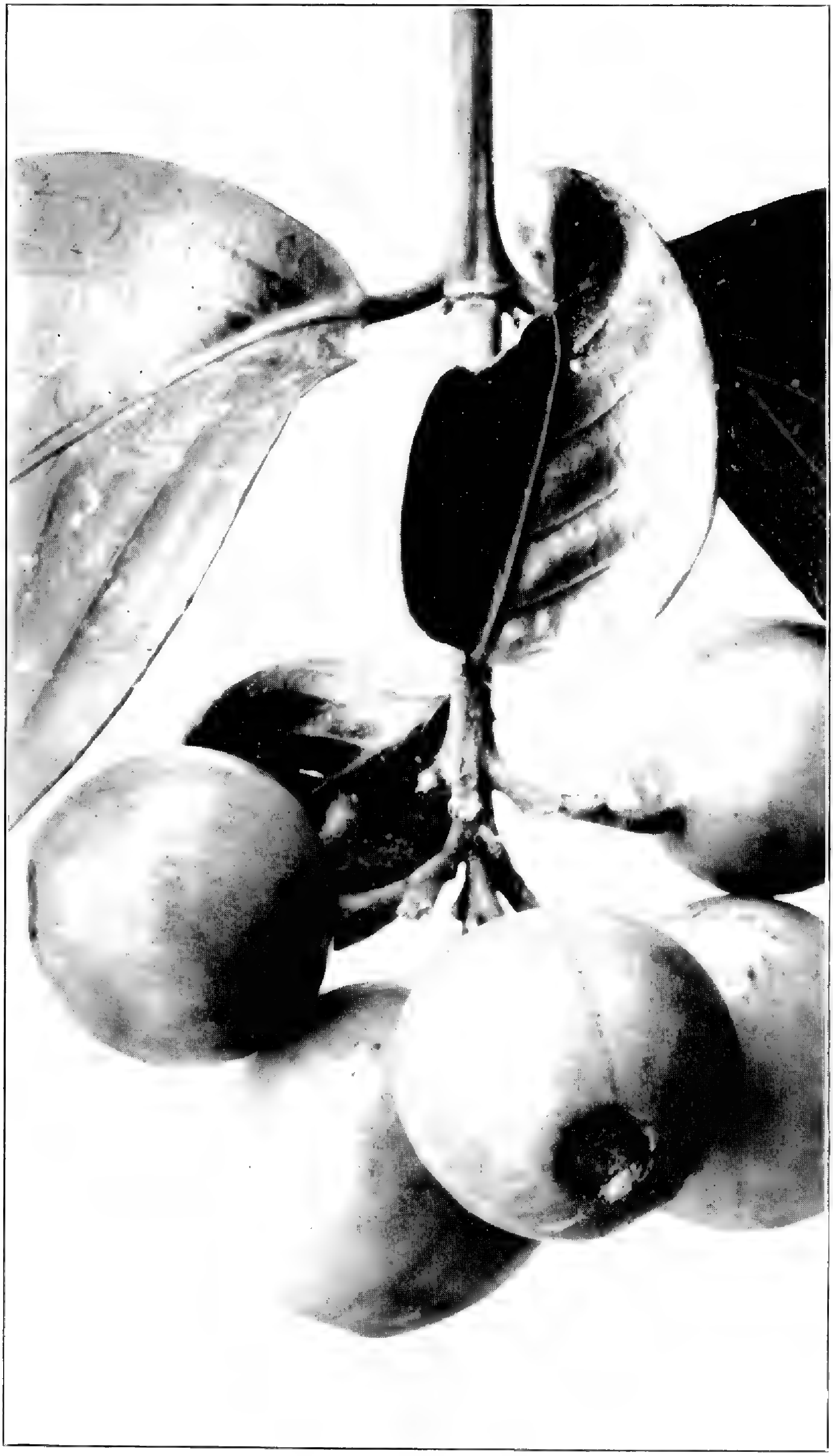


CALYCOPHYLLUM CANDIDISSIMUM



FLOWERING BRANCH OF PENTAGONIA MACROPHYLLA. (NATURAL SIZE)



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